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Scheduling Application in ASP.net/C#

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SCHEDULING APPLICATION IN ASP.NET/C#

A graduate project submitted to Dakota State University in partial fulfillment of the requirements for the degree of

Master of Science

in

Information Systems

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By
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PROJECT APPROVAL FORM

We certify that we have read this project and that, in our opinion, it is satisfactory in scope and quality as a project for the degree of Master of Science in Information Systems.

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ACKNOWLEDGMENTS

I would like to acknowledge a few people who, without their assistance, would have made this project much more difficult than it was.

First I would like to acknowledge Dr. Josh Pauli, my advisor and committee chair, who guided me through the entire project management and requirements engineering process.

Secondly I would like to acknowledge Mr. Chris Olson, whose expert knowledge in ASP.NET undoubtedly saved me from countless headaches and gave me direction while writing the actual application.

And finally I would like to acknowledge my family, who has been so supportive of me throughout the master's program and in everything I do.

ABSTRACT

The Women's Center at McKennan hospital in Sioux Falls, SD is in need of a new scheduling application that will save the scheduling committee both time and resources during each scheduling period. This paper is designed to illustrate the processes involved from the initiation phase, when the project manager first became aware of the situation, through the planning, designing, and execution of the project, all the way to the construction of the actual application.

This paper follows the 5 sections or phases of the work breakdown structure and through each, illustrates the deliverables that were identified and constructed. The deliverables were chosen based on the information requirement perceived in each phase. In the Initiation phase, the goal is to establish some preliminary information about the project, so for this phase the deliverables included: identifying the key stakeholders, establishing the project charter, and writing the business case for the project. In the Planning phase, the objective is to obtain some of the functional information about the application, and so for this phase, the project scope, the work breakdown structure, and the Gantt chart were identified as key deliverables. The Execution phase is concerned with gaining a detailed picture of the application in preparation for development. This phase identified deliverables such as: conducting an interview, establishing requirements, creating use cases, and creating the associated diagrams. The last two phases are concerned with how the reporting process was conducted, the actual production of the application, and preparing the final reports and conducting a lessons learned report.

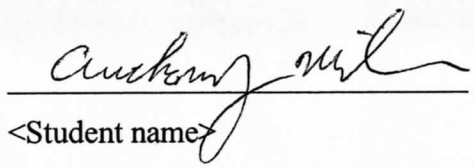
Once all of the information has been gathered, compiled and reviewed, the application can be written in such a way that the nurses at the Women's Center will know exactly what they are receiving and will be able to concentrate their efforts more on patients instead of reviewing and editing schedules.

DECLARATION

I hereby certify that this project constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions or writings of another.

I declare that the project describes original work that has not previously been presented for the award of any other degree of any institution.

Signed,



<Student name>

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INTRODUCTION

Background of the Problem

The Women's Center at McKennan Hospital in Sioux Falls, SD is in need of a new scheduling application that will replace their current scheduling process. They have been using the current process for the last four to five years, and prior to that, their scheduling process was entirely done by hand. They would like a custom application that can be accessed via the web so that users can gain access to the application from home or from work and that takes into account all of the provisions that they are currently implementing, while also incorporating some additional functionality.

Statement of the Problem

The current scheduling process at the Women's Center includes: Three weeks prior to the end of the current schedule (which is six weeks long), someone from the scheduling committee prints off a copy of an excel spreadsheet (with the date and names filled in) and posts it so that all of the nurses in the department have access to it. Once the document is posted, the nurses have two weeks to enter their desired schedules for the next scheduling period. Once the two week period has passed, someone from the scheduling committee collects the proposed schedule and begins the editing process, which is then reviewed by as many as 4 nurses and can take up to around eight hours over the final week to edit. Once the schedule has been reviewed and edited by the scheduling committee, it is posted so that the nurses know when they are supposed to work for the next scheduling period.

Problems with the current scheduling practice include:

- The current process does not take seniority into account. Currently the schedule is completed on a first-come-first-serve basis. (This is a main concern for the nurses and would like to see in the new application)
- There is no sort of check and balances in place. (i.e. there is no mechanism in place to ensure that the correct number of nurses are scheduled for any given day, evening or

night shift) This is also something that the nurses would like to see in the new application.

- The schedule that a nurse enters may not be the schedule that is posted at the end of the scheduling period for that nurse. That nurse may get moved based on either too few or too many nurses scheduled for any given day (checks and balances).
- There is no system in place for the nurses to access the application via the web. Currently the only access the nurses have to the application is when they come to work and see that it is posted.
- There needs to be a mechanism in place to prevent tampering with anyone's schedule. The current process is done in pencil and as such, does not stop anyone from erasing someone else's schedule and entering their own. They would like to be able to see who is working for the entire schedule but ensure that each nurse can only read the other schedules and not be able to edit them.

Objectives of the Project

For this project, two objectives have been established. The primary objective for this project is to demonstrate the project management and requirements engineering processes (Bray). The intent for this objective is to convey the process used from when the current situation at the Women's Center first arose, through the requirements elicitation process, through the planning and designing of a solution, and to how an initial stand alone application came to fruition that will begin to meet the Women's Center's requirements for years to come.

The secondary objective is to actually produce an application written in ASP.NET and C# (Hoffman) (Walther) that will take into account many of the provisions that are required and that will alleviate the concerns that have been brought forth by the members of the scheduling committee (as mentioned above). The end state of this objective is to have created a web site in ASP.NET with code behind

pages written in C# (Hoffman)(Walther). The design of the web site is written with a conjunction of ASP.NET and HTML and includes a separate CSS page for style (Estrella). Once the web site has been tested and ready for rollout, it will be brought before the scheduling committee where training and additional testing will be conducted. Once approved and implemented, the application will then be eligible to be expanded to other departments.

LITERATURE REVIEW

In the interest of maintaining chronological order, the work breakdown structure (WBS) outline (Appendix A) will serve as a guide throughout the elicitation and information gathering processes (Schwalbe). The WBS is broken down into 5 categories; Initiating, Planning, Executing, Controlling, and Closing. These 5 areas will illustrate the different areas of concern from how the information was gathered, what processes were utilized, and the deliverables that are expected in each section/phase.

The first section of the WBS affords a certain number of criteria that will form the foundation from which to begin the information gathering process. The templates utilized will enable a much better understanding of the project, both in terms of definition and of feasibility. Within the Initiation section, the project manager is encouraged to identify the key stakeholders, define the initial scope of the project, initiate the project charter, and prepare a relatively detailed business case, to include the financial analysis. These requirements will give the project manager a much clearer understanding of the question, 'is this project do-able'.

The four Initiation steps listed below show the initial information gathering processes that have been chosen for this project. They are elementary in nature but provide some critical information to the project manager in determining whether to pursue this project or not. The following list illustrates the four processes chosen for the Initiation phase.

1.0 Initiating

- 1.1 Determine/Assign Project Manager
- 1.2 Identify Key Stakeholders

1.3 Prepare Project Charter

1.4 Prepare Business Case

1.5 Edit and Review Initiation Requirements

Identifying the key stakeholders merely shows those that have a key interest in the project. This could range from a few people to entire departments, based on the type of project. In this case, the nurses that work at the Women's Center along with the project manager and project sponsor are listed in this report. The actual stakeholder analysis (Schwalbe) is listed below.

Table 1 Stakeholder Analysis

Stakeholder Analysis for: Scheduling Application in ASP.NET/C#

Prepared by: Tony Miles **Date: 15 June, 2007**

	Stakeholder 1	Stakeholder 2	Stakeholder 3	Stakeholder 4
Organization	Tony Miles Student	Dr. Pauli Professor	Scheduling Committee – Women's Center	Additional Nurses – Women's Center
Role on Project	Project Manager	Project Sponsor	Key Stakeholders	Stakeholders
Unique facts about Stakeholder	Completing MSIS Program	Supervisor/Mentor	Actual Customers	Customers/Will benefit from application
Level of Interest	High	High	High	Medium
Level of Influence	High	High	High	Medium
Suggestions on managing relationships		Keep well informed	Keep well informed	Possibly elicit suggestions from

Also during the Initiation phase, the project scope is introduced. The project scope (Schwalbe) provides an initial justification, begins to define the application requirements, lists deliverables, and provides the success criteria for the project. This is only a preliminary project scope and will be defined in more depth in the Planning phase. The initial success criteria for this project is to meet all of the requirements set fort by the members of the scheduling committee, and do so within budget and within a six month timeframe. The actual project scope is listed as Figure 4 on page 16.

The project charter is another requirement that identifies the roles and responsibilities of the key players involved in this project. It established who they are and what their role is in the overall project. For example, it lists the person's role, their name, the organization in which they currently work, and their contact information. Figure 1 (below) depicts the project charter (Schwalbe) for this project.

Project Charter

Project Title: Scheduling Application in ASP.NET/C#
Project Start Date: 16 June 2007 **Projected Finish Date: 20 Dec 2007**
Budget Information:

Project Manager: Tony Miles, Miles_1210@hotmail.com
Project Objectives: To create a web based scheduling application that meets the requirements of the nurses in the Women's Center at McKennan hospital in Sioux Falls, SD.

Roles and Responsibilities

Role	Name	Organization/ Position	Contact Information
Project Sponsor	Dr. Pauli	DSU Professor	605-256-5181
Project Manager	Tony Miles	DSU Student	605-361-6292
Scheduling Committee	Tamera, Suzie, Connie, Brenda, Terry	Nurse, McKennan Hospital	605-322-3400
Nursing Staff		McKennan Hospital	605-322-3400

Sign-off: (Requirements listed above have been agreed upon by associated parties.)

Comments: None

Figure 1 Project Charter

The business case and the financial analysis (Schwalbe) are the two documents in the Initiation phase that provide the most information and could be considered the determining factors for the project. The business case discusses such topics as:

- The business objective
- The current situation and problem/opportunity statement
- Critical assumptions and constraints
- Options and recommendations
- Project requirements

- Budget and schedule estimates
- The potential risks

The current situation should match what was discussed in the previous section and the critical assumptions cover issues such as: the nurses at the Women's Center are familiar with the Windows operating system, they are willing to use this new application, and that the nurses have a computer at home with internet access.

The budget and schedule estimates lead into the financial analysis, which is concerned with concepts such as: the Return on Investment, payback period, and Net Present Value. Of the requirements listed so far, the business case provides more in depth information than the other three mentioned and offers some tangible insight so that the project manager can begin to assess the projects complexity and help realize any projected resources. The business case for this project is listed as Figure 2, below.

Business Case for: Scheduling Application in ASP.NET/C#

Date: 11 July 07

Prepared by: Tony Miles

1.0 Introduction/ Background

The primary responsibility of the Women's Center at McKennan hospital is to provide for the care and delivery of both the mother and child, both pre and post partum. The scheduling committee has decided that they could increase productivity if they were able to use a web based scheduling application instead of the currently used hard copy process. This new application is designed and expected to increase the productivity of the scheduling committee by reducing the editing process from 8 hours down to approximately1 hour.

2.0 Business Objective

The scheduling committee's newest business strategy is to implement a web based application that allows nurses from the entire department to develop their own work schedule from the comfort of their own homes via the web. This new application is structured such that, with little manipulation, other departments can also benefit from its functionality. This new web based application is aimed at reducing the amount of editing the scheduling committee must perform during each scheduling period and should meet their scheduling requirements for years to come.

3.0 Current Situation and Problem/Opportunity Statement

The Women's Center is looking for a way to automate their current scheduling practices. Members of the scheduling committee suggest that expanding its services to the web would greatly enhance the productivity of the Women's Center within a one year timeframe. The Women's Center has been looking for an application that the nurses can access from the comfort of their home and have instant feedback. With this new

application, they believe this is the opportunity they have been waiting for.

4.0 Critical Assumption and Constraints

Critical assumptions include: The nurses that work on the Women's Center are familiar with the Windows operating system. The nurses are willing and able to use the new scheduling application. The majority of nurses have a computer with internet access accessible to them. McKennan Hospital will not object to the use of this application. Constraints for this project include: This application will take 2 months to become established, and become operational. The payback period will occur almost immediately. If this product is to be diversified into other departments, there will need to be some adjusting.

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5.0 Analysis of Option and Recommendation

Temporarily postpone the project and hire a consulting firm to concur/not concur with the current assessment.

Move forward with the proposed project and begin immediately.

Outsource the entire project with another company and risk substantial overhead. Revamp the project to include other departments within the hospital.

Reject the proposed project and keep current system.

6.0 Preliminary Project Requirements

The primary requirements of the scheduling application project include:

1. Developing the web based application allowing customers to input their desired schedule for the rating period.
2. Develop the support structure that encompasses the following attributes.
    - Enable users to log on to the application
    - Provide a registration page
    - Enforce seniority within the application
    - Provide the ability to choose any day, evening, or night

- Provide the ability to choose an 8 or 12 hour shift
- Save schedule once complete
- Provide the ability to load past schedules
- Provide instant feedback from schedule
- Ensure users can edit only their own schedule and not any one else
- Allow the entire schedule to be visible to everyone
- Make the schedule web accessible

7.0 Budget Estimate and Financial Analysis

A preliminary estimate of costs for the entire project is $230. This estimate is based on the project manager purchasing manuals and miscellaneous office equipment. Any additional nurses that provide input will not be paid for their assistance. After the project is completed, maintenance costs limited to hosting the web site and user training.

Projected benefits are based on a reduction in hours that the scheduling committee will spend on editing the new application. Projected benefits are also based on a small increase in productivity from the scheduling committee not having to spend as much time editing the new application. If the 4 members of the scheduling committee could save a total of 7 hours every 6 weeks editing the existing application, then their efforts could be better utilized on patients and their families. Since the nurses on the scheduling committee earn an average of $30 per hour, this would save the hospital $210 every six weeks, and a total of $1820 per year.

Figure 4 summarizes the projected costs and benefits and shows the estimated net present value (NPV), return on investment (ROI), and year in which payback occurs. It also lists assumptions made in performing this preliminary financial analysis. All of the financial estimates are very encouraging. The estimated payback is within one year, as requested by the sponsor. The NPV is $490, and the ROI is based on a three year system life is excellent at 140 percent.

8.0 Schedule Estimate

The sponsor would like to see the project completed within six months, but there is some flexibility in the schedule. We also assume that the new schedule will have a useful life of at least three years.

9.0 Potential Risks

- Hospital could purchase off the shelf product that meets the customer's requirements.
- Key stakeholders leaving the hospital or missing work for an extended period of time.
- Hospital loosing interest within the development timeframe.
- Educational institution loosing interest within the development timeframe.
- Timeline extensions in the project.
- Money shortfalls in the project.
- Misinterpreting the financial benefits.
- Lack of interest in the new application.

10.0 Exhibits

Figure 4: Financial Analysis

Figure 2 Business Case

As mentioned, the business case touches on the financial aspects of the business plan, but saves the details of the schedule and cost estimate for the financial analysis. The financial analysis (Schwalbe) is a more thorough spreadsheet that lists the costs and benefits for the project and summarizes each over a given timeframe. The financial analysis for this project depicts the payback period about three quarters of the way through the second month and has an ROI of 140%. In addition to the ROI, the Women's Center is projected to see a savings of $210 per month. This savings is a result of not having to spend 7 hours of time every scheduling period editing the schedule. This savings of time and money could easily be put right back into the patients that the nurses are in charge of taking care of and eases some of the administrative burden of requiring such a commitment from the nurses to edit the schedule. The financial analysis for this project is listed as Figure3 (below).

Discount rate	0.0%					
	Month 1	Month 2	Month 3	Month 4	Month 5	Total
Benefits						
Increased Productivity	$ -	$ 210	$ 210	$ 210	$ 210	$ 840
Total benefits	$ -	$ 210	$ 210	$ 210	$ 210	$ 840
Total discounted benefits	$ -	$ 210	$ 210	$ 210	$ 210	$ 840
Cumulative discounted benefits	$ -	$ 210	$ 420	$ 630	$ 840	
Operational costs						
Hardware	$ 200	$ -	$ -	$ -	$ -	$ 200
Web Hosting	$ 30	$ 30	$ 30	$ 30	$ 30	$ 150
Total Operational costs	$ 230	$ 30	$ 30	$ 30	$ 30	$ 350
Total costs	$ 230	$ 30	$ 30	$ 30	$ 30	$ 350
Total discounted costs	$ 230	$ 30	$ 30	$ 30	$ 30	$ 350
Cumulative discounted costs	$ 230	$ 260	$ 290	$ 320	$ 350	
Net Benefits	$ (230)	$ 180	$ 180	$ 180	$ 180	$ 490
NPV	$490	$490				
IRR	69%					
Return on investment	140%	140%				

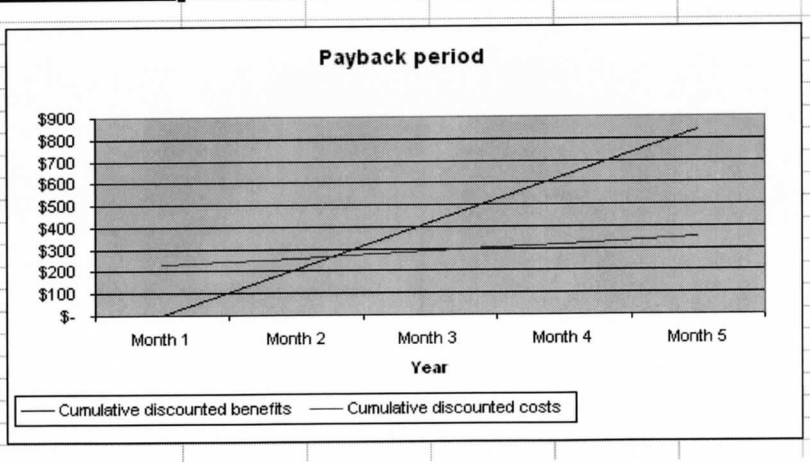

Figure 3. Financial Analysis

Once the requirements for the Initiation phase have been met, then the project manager is ready to move into the planning phase of the project. The first step in the planning process is for the project manager to meet with the project sponsor and layout some of the more detailed information requirements that will be needed prior to the execution phase. Up until this point, only preliminary information has been gathered (stakeholder analysis, project charter, and business case). During the planning phase, additional tasks and a structured schedule are developed that enable the project manager to focus his efforts and concentrate on obtaining some of the functional information that will be needed. The primary output from the planning phase is the revised project scope statement, a Work Breakdown Structure, and a Gantt chart (Tegarden). The following outline depicts the planning phase of the WBS.

2.0 Planning

- 2.1 Hold Initial Meeting w/ Project Sponsor
  - 2.1.1 Consolidate Initial Meeting Notes
  - 2.1.2 Prepare Consolidated Document
- 2.2 Prepare Scope Statement
- 2.3 Prepare WBS
- 2.4 Prepare Gantt Chart
  - 2.4.1 Determine Task Resources
  - 2.4.2 Determine Task Durations
  - 2.4.3 Determine Task Dependencies
- 2.5 Review and Finalize Gantt Chart
- 2.6 Edit and Review Planning Requirements

The scope statement was started in the Initiation phase and is where the project manager begins to understand the requirements of the new system that is being developed. The scope statement provides the justification of the project, along with the product requirements, what deliverables are to be met, and which criteria will lead to the success of the project. This document gets away from the business side of the project and begins to touch on the functionality of the new application. The justification section reiterates some of

the financial benefits listed in the business case as well as some background information on the current scheduling process.

In addition to the scope statement, the planning phase is also concerned with the Work Breakdown Structure (Appendix A) and the Gantt chart (Appendix B). The Gantt chart is essentially the WBS plotted over time. The Gantt chart (Tegarden) offers an illustration of the tasks that need to be completed, how long they will take, and any dependencies that may exist between them. For example the Scope Statement must be prepared before the Work Breakdown Structure is written; therefore the WBS is dependent on the Scope Statement and is denoted by an arrow connecting the two tasks. Within the Gantt chart, the project manager can establish dependencies between any two tasks and also establish milestones within the schedule. From the Gantt chart, the project manager can then create a network diagram, which is a visual aide that can help the project manager gain a visual perspective of the project. Figure 4 (p. 17) depicts the use of the project scope and Appendix B illustrates the use of a Gantt chart as they pertain to this project.

Note: The Gantt chart contains the WBS along the left side of the form and the timeline (in months) across the top. Dependencies are denoted by arrows connecting two tasks. Any milestones are denoted by black diamonds and are not associated with not having any duration.

After the Gantt chart is complete, the project manager can then review the Gantt information in graphical form in a network diagram. The network diagram helps the project manager realize, what's known as a critical path, which is denoted by boxes that are connected to each other and display the duration of each task along with the task name and number. The longest path equates to the most efficient timeline for the project. The network diagram is a tool commonly used by project managers in helping allocate resources and determine task mobility. The network diagram for this project is illustrated in Appendix C and is broken down into the five phases of the work breakdown structure. Appendix C lists the five phases separately to help make the diagram more readable and to help eliminate clutter.

SCOPE STATEMENT

Project Title: Scheduling Application in ASP.NET/C#

Date: 21 July 2007 **Prepared by:** Tony Miles – Project Manager

Project Justification:

As a result of current scheduling practices at the Women's Center at McKennan hospital in Sioux Falls, the scheduling committee is looking for a new scheduling application that will greatly simplify their current scheduling practices. Recent endeavors to purchase off the shelf products have fallen short in both performance and meeting the scheduling committee's requirements. Scheduling committee members suggest that a custom application will greatly enhance current scheduling practices and save the scheduling committee approximately 7 hours of editing every scheduling period (6 weeks). The proposed scheduling application is not limited to the Women's Center and can be expanded to meet virtually any department at McKennan Hospital. This application is estimated to take 6 months and cost $230 to develop. Further budgeting beyond implementation is estimated at $30 per year for the next 5 years (web hosting)

Product Characteristics and Requirements:

- This application will be web based so that all members of the Women's Center can access it from home through the web.
- The application must allow for different types of nurses to input their schedules.
- The application must allow for seniority.
- The application must have an attractive and easy to use GUI.
- The application will allow users to choose a date, shift, and the number of hours desired and be saved on the local hard drive.
- The application must roll up all nurses into a master document that can be

read by all and edited by select individuals.

Summary of Project Deliverables

Project management-related deliverables:

Stakeholder Analysis, Project Charter, Business Case, Scope Statement, WBS, Gantt Chart, Requirements, Use Cases, Final Project Presentation, Final Project Report, Lessons-Learned Report, and any other documents required to manage the project.

Product-related deliverables: research reports, design documents, software code, hardware, etc.

- Stakeholder Analysis
- Project Charter
- Business Case
- Feasibility Analysis
- Project Scope Work Breakdown Structure
- Gantt Chart using
- Interview: scheduling committee interview to determine functional requirements of the new application
- Requirements
- Use Cases
- Sequence Diagrams
- Actual Application
- Application Code

Project Success Criteria:

The goal is to develop a web-based application and support structure that allows customers to enter their desired 6 week schedule over the internet. The project must be completed within 6 months and under $500. This project must meet all specifications listed in the product characteristics and requirements section (above). Success will be determined if the payback period meets or exceeds the proposed timeline listed in the

financial analysis portion of the business case, and meets the requirements set forth by the scheduling committee.

Figure 4 Project Scope

Up until this point the project manager has been able to ascertain some of the preliminary requirements, as well as some of the required functionality for this project. The preliminary requirements included:

- Identifying the key stakeholders
- Completing the project charter
- Completing the business case

Some of the functional requirements included:

- The project manager meeting with the project sponsor
- Preparing a scope statement
- Preparing a work breakdown structure
- Preparing a Gantt chart

The meeting with the project sponsor was simply an opportunity to focus the project manager's efforts and ensure that the projected requirements were being met. The project scope, as mentioned, was started back in the Initiation phase and refined in the Planning phase. It depicted some of the functional requirements for this project, such as the justification and requirements, and gave the project manager some insight into what the success criteria were and what deliverables were needed for the project.

The work breakdown structure is another tool that gives the project manager an overall picture of the different processes utilized throughout this project and is typically divided into

sections or phases. The different phases give the project manager a generalized view of the project and give him an idea what deliverables can be expected in each phase. As mentioned earlier, the WBS (Appendix A) contains five phases and is being used as a guide to help maintain chronological order.

Now that the project manager has a better understanding of the requirements and deliverables of the new system, he is ready to conduct an interview with members of the scheduling committee at the Women's Center. The Interview will offer the project manager a much better understanding of the problem, as well as give him a more personal feel to what the members would like to see in the new application. By conducting an interview instead of a questionnaire or random sampling, the project manager is able to gain information that, under normal circumstances, would not be considered tangible, and because of this, the information obtained will lead to a much more thought out process, and in the end, a better product. The actual interview for this project will be discussed in more detail in the next section.

SYSTEM DESIGN (RESEARCH METHODOLOGY)

The Execution phase begins with requirements elicitation, which in this case, an interview was chosen as the primary elicitation process. Once the interview is complete, the information is reviewed and turned into requirements for the new system. After the requirements have been identified, use cases (Cockburn) can then be developed, which culminate in a series of graphical diagrams. Each element of the Execution phase is listed and described in more detail below.

3.0 Execution
- 3.1 Interview
  - 3.1.1 Consolidate Interview Questions
  - 3.1.2 Review and Edit Interview Q and A
- 3.2 Prepare Requirements
  - 3.2.1 Login ID/Password
  - 3.2.2 Calendar
  - 3.2.3 Save
  - 3.2.4 Load
  - 3.2.5 Exit
- 3.3 Prepare Use Cases
- 3.4 Application Design
- 3.5 Application Construction
- 3.6 Complete Construction
- 3.7 Application Testing
- 3.8 Application Rollout
- 3.9 Execution Edit and Review

As mentioned in the previous section, an interview was conducted for the elicitation requirement. An interview with the customers is the most timely and accurate and is the

preferred method for gathering information about the proposed application. With a questionnaire or a random sampling, the project manager will not get as accurate of an answer as he would by conducting an interview. In this instance, the interview was emailed to the intended recipients one week prior to the interview to facilitate the thought process behind the questions. When it came time for the interview, the respondents had had enough time to think about the questions and this allowed for a stimulating conversation and it turned out to be a much more productive environment and also saved time. The questionnaire/interview used was broken into 5 parts;

- Introduction and Overview
    - The purpose of this section is to gain some general information about the users. In this case questions such as: their name, key responsibilities, and 'how is success measured' were asked.
- User Profile/Background of the problem
    - During this section, questions were asked about previous attempts to purchase off-the-shelf products.
- The Problem itself questions include:
    - What is it about the current system that needs to be changed
    - What would you like to see in the new application
- The User Environment (training requirements etc…). More general requirements:
    - What level of training will be needed
    - Nurses educational background
    - Platform currently in use

The interview listed in Appendix D is the actual interview that was used and it provided for a significant portion of the requirements elicitation process. The interview contains the questions used, as well as a rollup of the answers that were given.

Once the interview was complete, the project manager consolidated all of the answers received into one document. From this document, the project manager started listing all of the requirements for the new system. A requirements list enables the project manager to identify specific functions that must be accounted for in the new application. The requirements for this project (which is posted in Appendix E) ranged from: being able to log on to the system, to editing and saving a proposed schedule, to management editing and saving an approved schedule. Once the requirements have been identified, the project manager divides each main requirement into a use case. The use cases help redefine the functionality of each requirement and help identify the success criteria for each requirement. In addition to the success criteria, the use case also helps the project manager define any triggers, preconditions, conditions that will lead to failure, and any extensions that the success scenario may have. In this project, there were ten use cases (Cockburn) (Quatrani) identified and they are listed in Appendix F.

After the requirements have been identified and the use cases established, the project manager creates a graphical representation of all of the use cases, which is called a use case diagram. This diagram helps illustrate the use cases involved and the primary actor associated with each. The use case diagram for this project is depicted in Appendix G.

Along with the use case diagram (Cockburn), the sequence diagram (Quatrani) (Fowler) (Biafore) is another graphical representation commonly used by project managers to help visualize the different requirements of the system. The sequence diagram is an illustration of an individual use case and shows the flow of information between the primary actor, the system, and, in this case, a database. For this application, there are ten use cases, and as such, are also ten sequence diagrams (Fowler) (Biafore) (Appendix H), one for each use case. Now that the project manager has completed the different diagrams associated with each requirement, it becomes much easier to see how information is passed between the different entities and this helps him facilitate the writing of the application.

Now that the project manager has developed all of the information requirements, he can start to construct the web site. The web site must contain a login page, a register page (in case the user does not have a name and password), and a schedule page so that the user can

create their own schedule. In addition, it must also contain a mechanism to load an existing schedule, a mechanism to save a schedule, and a database to store both the employee and schedule information. The application must be web based and conform to the windows operating system. As mentioned earlier, the web site will be constructed in ASP.NET with code behind pages written in C#. The design is written in ASP.NET and HTML (Lehnert) with a separate CSS style sheet (Estrella). The different pages of the web site are discussed below.

CASE STUDY (RESULTS AND DISCUSSION)

Now that the requirements for the primary objective have been identified, the project is ready to be constructed. As eluded to, the secondary objective, (the actual application) is to contain a login page, a register page, and a schedule page. The functional requirements are to include: a save mechanism, a load mechanism, and a database. In addition to the functional requirements, the correct permissions must be accounted for in order for the correct nurse/manager to be able to edit, save and delete any information throughout the scheduling process.

Up until this point, the project manager has already started to create the web pages. Of the many processes that have been outlined in the previous sections, the login page, the register page and the schedule page have already been written. The areas that still need to be addressed include: the database, the load mechanism, and the save mechanism. Then once these parameters have been taken care of, then the permissions can be assigned. The application thus far does not yet provide the entire functionality that is needed for the project to work as intended, and it is the author's intent to add the remaining functionality over the course of the next several months in order to meet the Women's Center's requirements. Appendix I lists all of the code that has been created for the application so far.

To expound on the pages that have been created so far, it is necessary to first gain a broad perspective and look at the Solution Explorer window for the project. The Solution Explorer (Figure 5), which was created in Microsoft Visual Studio 2005 illustrates the main files that are part of this application. From here it is easy to see that there is a CSS page called StyleSheet.css (Estrella) and code behind pages written for each page in the application.

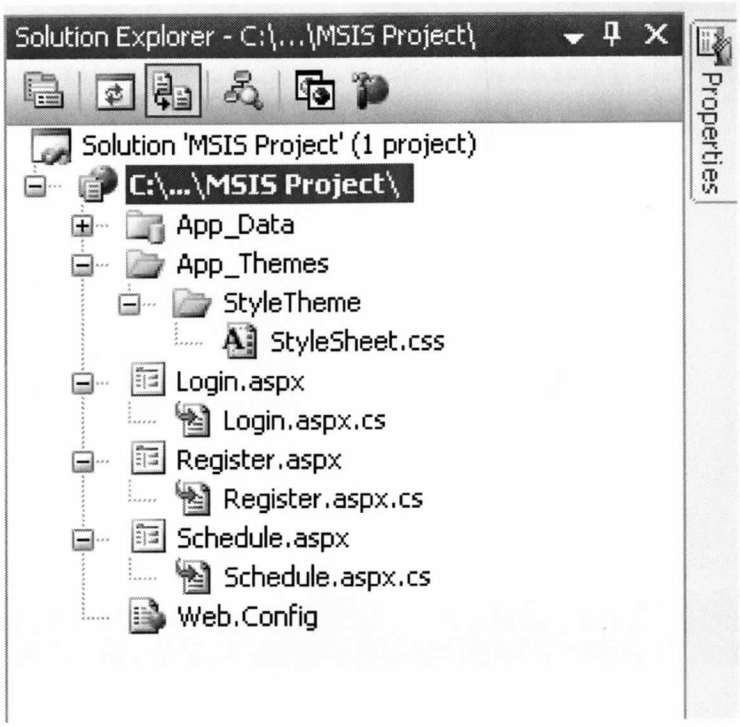

Figure 5 Solution Explorer

This StyleSheet.css and code behind pages were created to eliminate clutter and make the code more readable, while also providing some of the aesthetics for the Schedule.aspx page. As mentioned, there are three pages of this application that provide the core functionality for the web site, Login.aspx, Register.aspx, and Schedule.aspx. The Login.aspx and the Register.aspx pages are inherently part of the core functionality of the .NET framework and as such needed only minor modification prior to implementation. The Schedule.aspx page is the focal point of this application and is where the additional mechanisms will need to be placed, along with where the permissions for the nurse/manager will need to be located.

When the user first enters the ULR, they are directed to the Login page. The Login page has the user enter their user name and password and also displays a checkbox that asks the user whether or not they want to be remembered for next time. If the user does not enter

the correct user name or password, then they are directed to the register page. A register link is also provided in case the user does not yet have a user name and password. Once the use has obtained a user name and password, then they click on the Log In button and are directed to the schedule page. The following is a snapshot of the Login page.

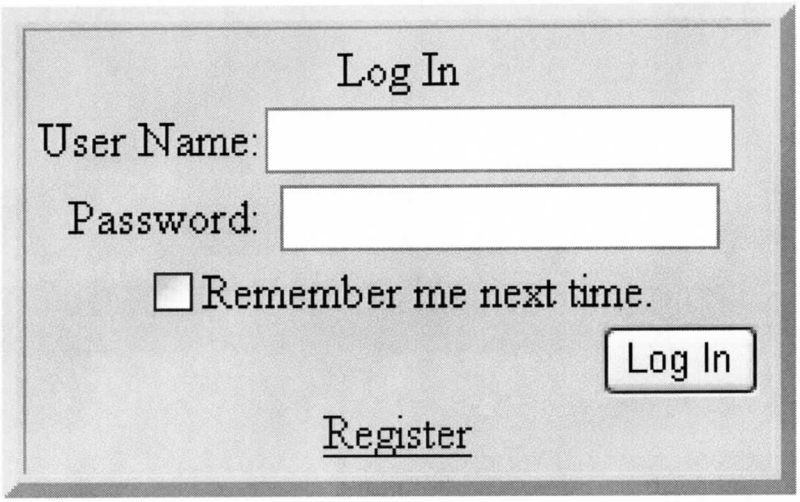

Figure 6 Login Page

As mentioned, if the user is new or enters their user name or password incorrectly, they are directed to the register page, where the page prompts the user to sign up for a new account. Within the register page, the user is required to enter a user name and password. Once they have entered their new user name and password, the form requires them to confirm their password, enter a security question and a security answer. All of these fields are mandatory for a user to receive a valid user name and password. If the user enters a user name that has already been taken, then the user receives an error message to choose another user name. And finally the register page contains a 'Create User' button to submit the entered date and direct the user back to the login page. Figure 6, below shows a depiction of the register page.

Figure 7 Register Page

After the user has created a user name and password, and entered it into the log in page, then they are directed to the schedule page. The schedule page consists of 2 tables, a list box, and a button. Table 1 contains the calendar from which the nurses will choose a date to work, and the other table contains a series of radio buttons for the type of shift and the number of hours to choose from. The page also contains a submit button and a list box control that lists the data once the user has selected it. A depiction of the schedule page is shown below.

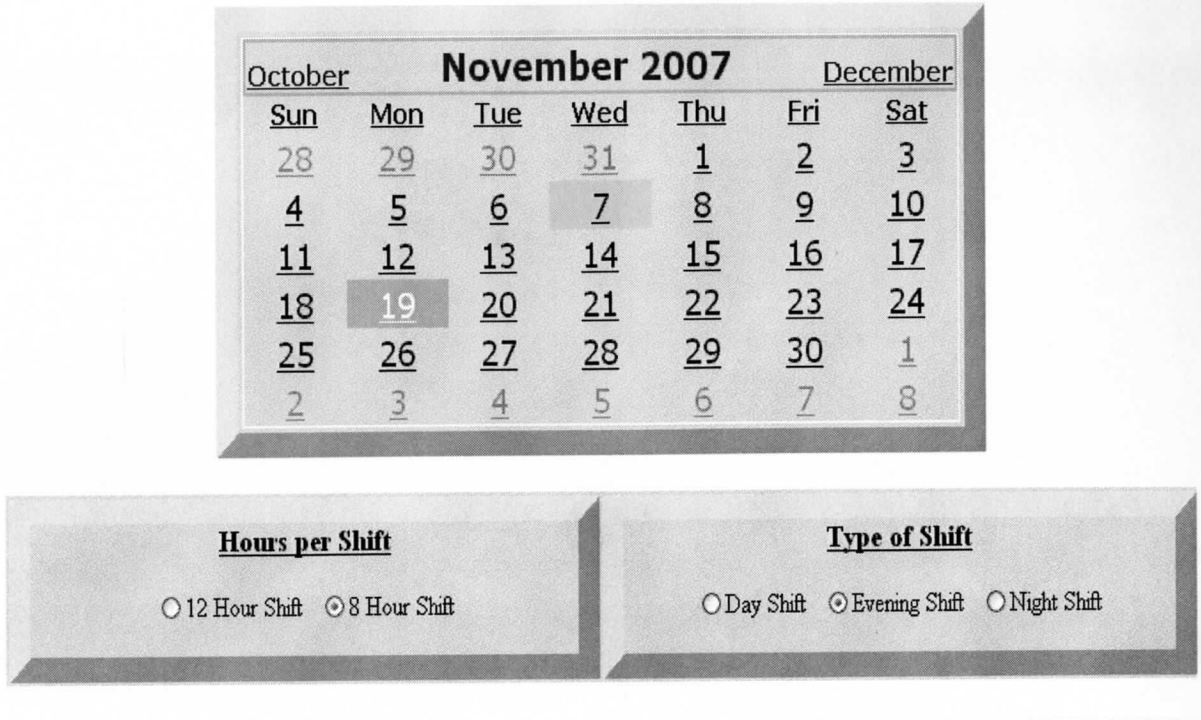

Figure 8 Schedule Page

Now that the project manager has created the web pages for the application, the tasks that still remain for the second objective to be complete are for the additional mechanisms to be added and permissions assigned. The mechanisms that are not part of the system yet include a save button, so that the user can save their scheduling information to the hard drive, a load button, so that once a project is saved, it can be later revisited and edited for

completion, and a database to store the employee and schedule information. The permissions simply need to be such that, when a nurse is looking at the entire schedule, they have read permissions for everyone else and read/write permissions for themselves. The other permission that needs to be addressed is one that gives management read/write access permissions for everyone, and a delete option in the event they would like to delete the entire schedule and start over.

Once the schedule is complete, then it is time for the project manager to consolidate his efforts and submit his last status report. Phases IV and V of the WBS illustrate the controlling and closing aspects of this project and what deliverables are expected.

4.0 Controlling

- 4.1 Status Report

5.0 Closing

- 5.1 Prepare Final Project Report
- 5.2 Prepare Final Presentation
- 5.3 Lessons Learned
- 5.4 Submit

Phase IV mentions the status reports that were expected throughout the project. To note, throughout the project, there were numerous status reports given to the project sponsor, but they were primarily conducted through telephone conversations, emails, and face to face conversations. There was never a need for the status reports to be put to paper, but they certainly could have been documented. Topics for the status reports included: current efforts within the project, any issues that need to be resolved, and the direction the project needs to be heading in. Status reports have also been shared among the scheduling committee at the

Women's Center, both to keep them informed and to gain any insight they may have in regards to the project.

Phase V is primarily concerned with the project report, the final presentation and the lessons learned report. The principle component of Phase V that needs addressing is the lessons learned report, which is discussed in the next section.

CONCLUSIONS

To reiterate, the objectives for this project were to:

1- To demonstrate the project management and requirements engineering processes (Pfleeger)
   - The intent for this is to convey the process used from when the current situation at the Women's Center first arose,
   - To illustrate the planning that went into the project
   - To depict the thought process behind the design
   - To demonstrate the requirements elicitation process
   - To show how the information lead to the development of the application

2- To actually produce an application written in ASP.NET and C# that will take into account the required provisions set forth by the scheduling committee.
   - The end state will be the beginnings of a web site that can perform all of the functionality the Women's Center is currently using plus the additional functionality identified in the Initiation phases

The deliverables that were scheduled for this project were introduced in the Work Breakdown Structure and also identified in each of the 5 sections of the WBS.

The Initiation phase identified:

- The project manager
- The key stakeholders
- The project charter
- The business case

- The financial analysis.

The deliverables in the planning phase included:

- The Scope statement
- The WBS
- The Gantt Chart
- The Network Diagram

The Execution phase deliverables included:

- The Interview
- The Requirements List
- Use Cases
- Use Case Diagram
- Sequence Diagrams

The controlling section discussed how status reports were given throughout the project and the closing section concludes with the final report, presentation, and the lessons learned report.

Lessons Learned

The lessons learned throughout this project were numerous and vast. Many of the templates and forms I chose for this project were initially introduced in Dr. El-Gayar's Project Management (INFS 724) and Systems Analysis and Design (INFS 720) courses. Using these templates along with referencing my course work and conducting research, I was reintroduced to many of the principles and techniques learned throughout the MSIS program. There was also a bit of an awakening to the realization that, when the project was first introduced, there did not appear to be an exorbitant amount of information to be gained. The project seemed fairly straightforward, but as the process moved forward, the amount of information grew exceedingly fast and I found myself (along with Dr. Pauli's guidance) having to narrow the scope of the project in order to meet the timeframe that was laid out.

Another lesson learned was that, while I was trying to gather information on the root of the problem, through the interview process, the members of the scheduling committee were only concerned with the functionality of the new application. There was at first some confusion as to why I needed to know all of the background information prior to simply sitting down and writing the application, but once the process was explained, the flow of information went much smoother.

I was also surprised by the level of training that some of the users would require. Through the interview process, I learned that some of the potential users have little to no computer experience, while some have moderate to extensive experience.

After talking with several businesses in Sioux Falls area, I learned that many of them, if not already there, are transitioning into the .NET environment and especially C# on the development side (versus VB or C++). In addition to conducting all of the information requirements (Pfleeger) (Bray) for the project, I also found myself having to learn the languages of C# and ASP.NET. Looking back, I may/may not have been better off using a

development tool such as FrontPage or Dream Weaver, but nonetheless, the application they need will still need to be written from scratch as previous attempts to purchase off-the-shelf products have not been successful.

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APPENDICES

APPENDIX A: WBS OUTLINE

Work Breakdown Structure for:
Scheduling Application in ASP.NET/C#

Prepared by: Tony Miles **Date: 17 May 07**

1.0 INITIATION
- 1.1 Determine/Assign Project Manager
- 1.2 Identify Key Stakeholders
- 1.3 Prepare Project Charter
- 1.4 Prepare Business Case
- 1.5 Edit and Review Initiation Requirements

2.0 Planning
- 2.1 Hold Initial Meeting w/ Project Sponsor
  - 2.1.1 Consolidate Initial Meeting Notes
  - 2.1.2 Prepare Consolidated Document
- 2.2 Prepare Scope Statement
- 2.3 Prepare WBS
- 2.4 Prepare Gantt Chart
  - 2.4.1 Determine Task Resources
  - 2.4.2 Determine Task Durations
  - 2.4.3 Determine Task Dependencies
- 2.5 Review and Finalize Gantt Chart
- 2.6 Edit and Review Planning Requirements

3.0 Execution
- 3.1 Interview
  - 3.1.1 Consolidate Interview Questions
  - 3.1.2 Review and Edit Interview Q and A
- 3.2 Prepare Requirements
  - 3.2.1 Login ID/Password
  - 3.2.2 Calendar
  - 3.2.3 Save
  - 3.2.4 Load
  - 3.2.5 Exit
- 3.3 Prepare Use Cases
- 3.4 Application Design

- 3.5 Application Construction
- 3.6 Complete Construction
- 3.7 Application Testing
- 3.8 Application Rollout
- 3.9 Execution Edit and Review

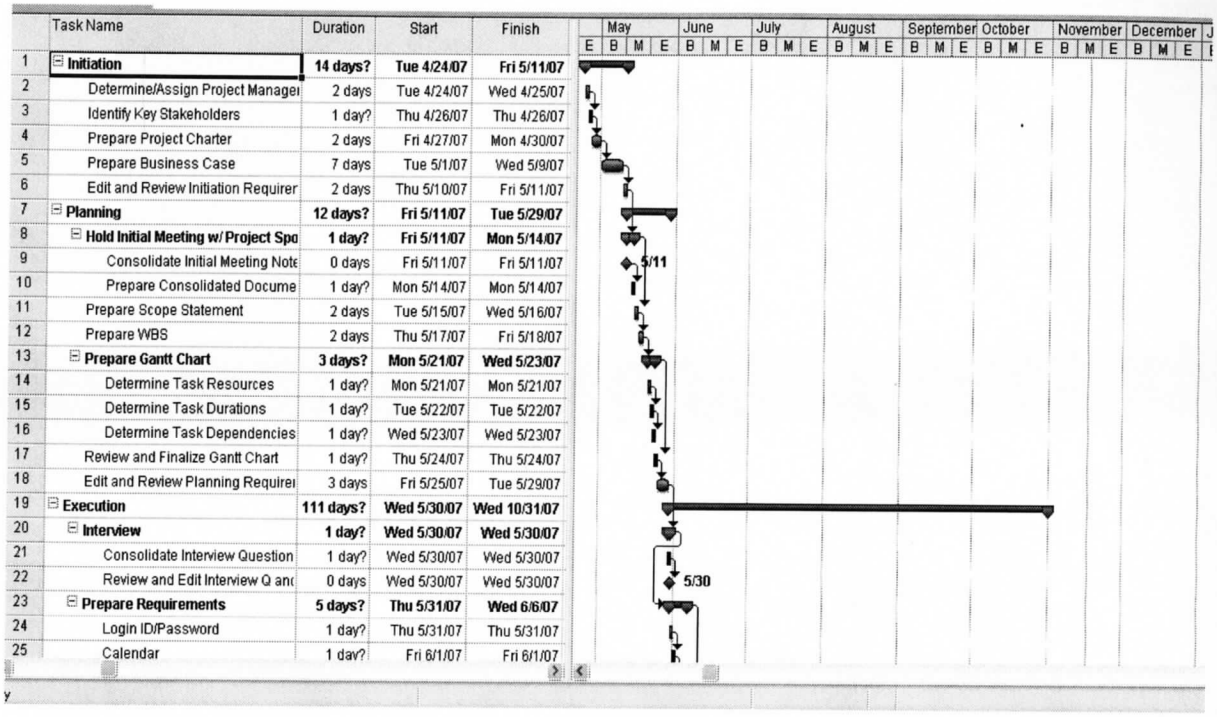
4.0 Controlling

- 4.1 Status Report

5.0 Closing

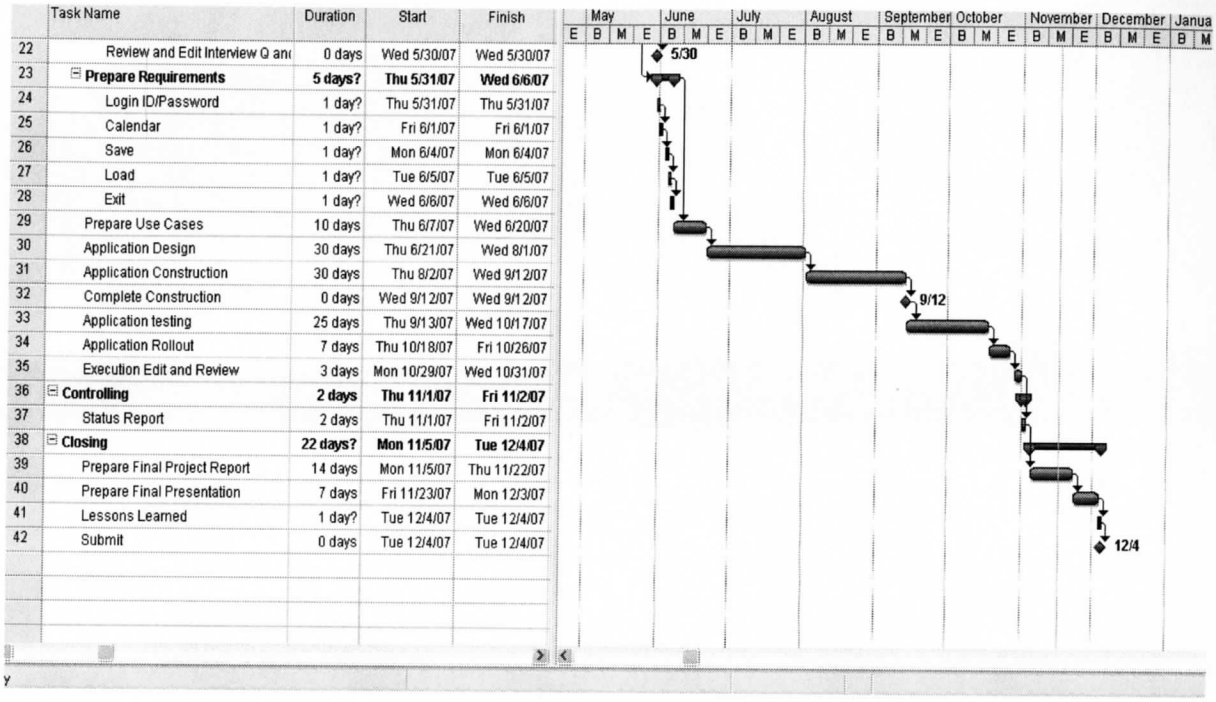
- 5.1 Prepare Final Project Report
- 5.2 Prepare Final Presentation
- 5.3 Lessons Learned
- 5.4 Submit

APPENDIX B: GANTT CHART



	Task Name	Duration	Start	Finish
1	**Initiation**	**14 days?**	**Tue 4/24/07**	**Fri 5/11/07**
2	Determine/Assign Project Manager	2 days	Tue 4/24/07	Wed 4/25/07
3	Identify Key Stakeholders	1 day?	Thu 4/26/07	Thu 4/26/07
4	Prepare Project Charter	2 days	Fri 4/27/07	Mon 4/30/07
5	Prepare Business Case	7 days	Tue 5/1/07	Wed 5/9/07
6	Edit and Review Initiation Requirer	2 days	Thu 5/10/07	Fri 5/11/07
7	**Planning**	**12 days?**	**Fri 5/11/07**	**Tue 5/29/07**
8	**Hold Initial Meeting w/ Project Spo**	**1 day?**	**Fri 5/11/07**	**Mon 5/14/07**
9	Consolidate Initial Meeting Note	0 days	Fri 5/11/07	Fri 5/11/07
10	Prepare Consolidated Docume	1 day?	Mon 5/14/07	Mon 5/14/07
11	Prepare Scope Statement	2 days	Tue 5/15/07	Wed 5/16/07
12	Prepare WBS	2 days	Thu 5/17/07	Fri 5/18/07
13	**Prepare Gantt Chart**	**3 days?**	**Mon 5/21/07**	**Wed 5/23/07**
14	Determine Task Resources	1 day?	Mon 5/21/07	Mon 5/21/07
15	Determine Task Durations	1 day?	Tue 5/22/07	Tue 5/22/07
16	Determine Task Dependencies	1 day?	Wed 5/23/07	Wed 5/23/07
17	Review and Finalize Gantt Chart	1 day?	Thu 5/24/07	Thu 5/24/07
18	Edit and Review Planning Requirer	3 days	Fri 5/25/07	Tue 5/29/07
19	**Execution**	**111 days?**	**Wed 5/30/07**	**Wed 10/31/07**
20	**Interview**	**1 day?**	**Wed 5/30/07**	**Wed 5/30/07**
21	Consolidate Interview Question	1 day?	Wed 5/30/07	Wed 5/30/07
22	Review and Edit Interview Q an	0 days	Wed 5/30/07	Wed 5/30/07
23	**Prepare Requirements**	**5 days?**	**Thu 5/31/07**	**Wed 6/6/07**
24	Login ID/Password	1 day?	Thu 5/31/07	Thu 5/31/07
25	Calendar	1 day?	Fri 6/1/07	Fri 6/1/07

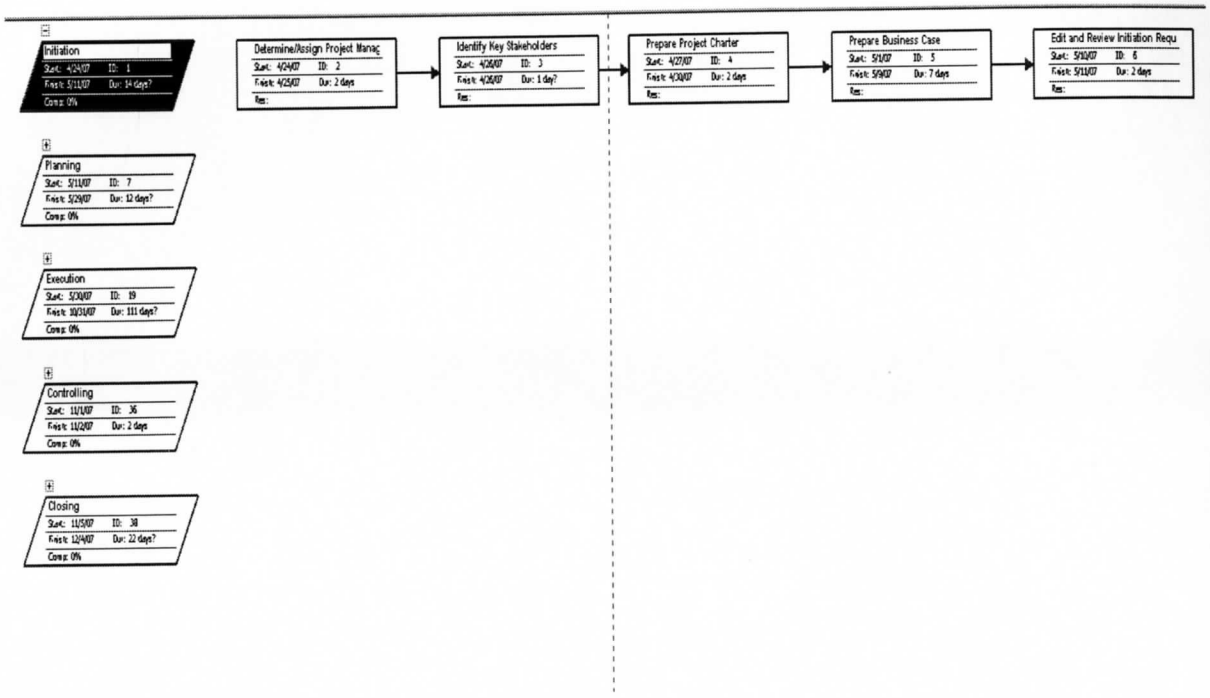
GANTT CHART (CONT.)



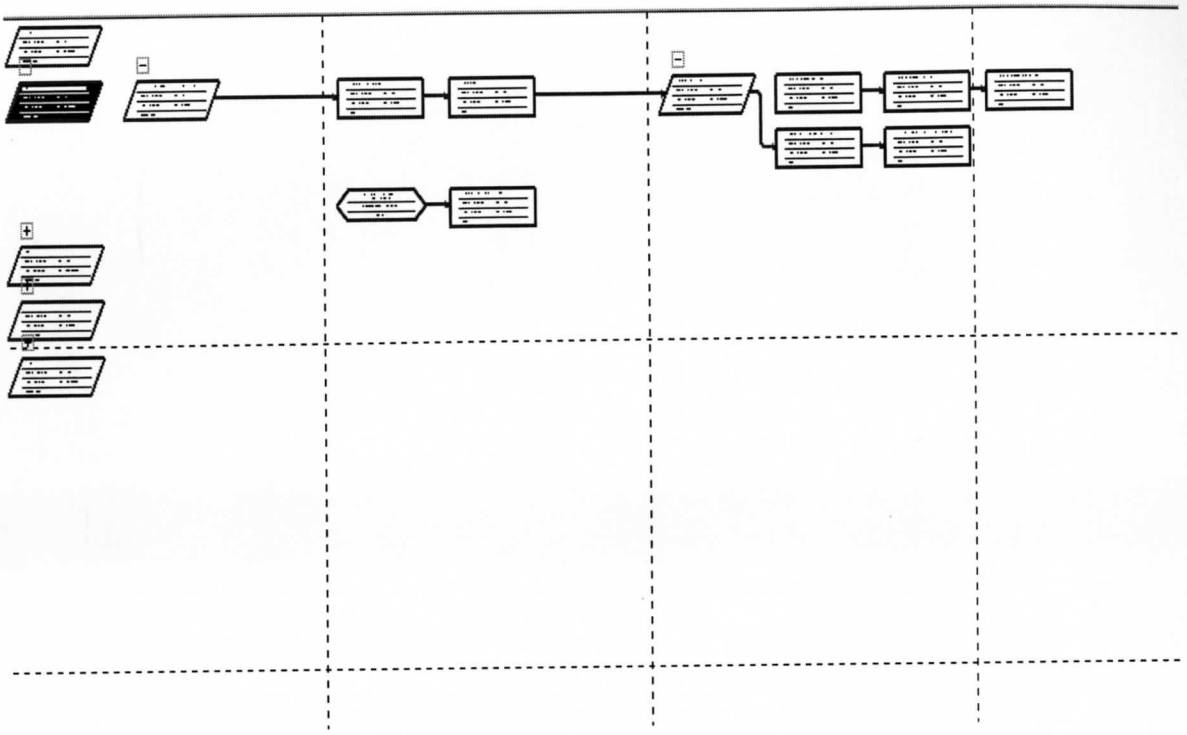
	Task Name	Duration	Start	Finish
22	Review and Edit Interview Q an	0 days	Wed 5/30/07	Wed 5/30/07
23	**Prepare Requirements**	**5 days?**	**Thu 5/31/07**	**Wed 6/6/07**
24	Login ID/Password	1 day?	Thu 5/31/07	Thu 5/31/07
25	Calendar	1 day?	Fri 6/1/07	Fri 6/1/07
26	Save	1 day?	Mon 6/4/07	Mon 6/4/07
27	Load	1 day?	Tue 6/5/07	Tue 6/5/07
28	Exit	1 day?	Wed 6/6/07	Wed 6/6/07
29	Prepare Use Cases	10 days	Thu 6/7/07	Wed 6/20/07
30	Application Design	30 days	Thu 6/21/07	Wed 8/1/07
31	Application Construction	30 days	Thu 8/2/07	Wed 9/12/07
32	Complete Construction	0 days	Wed 9/12/07	Wed 9/12/07
33	Application testing	25 days	Thu 9/13/07	Wed 10/17/07
34	Application Rollout	7 days	Thu 10/18/07	Fri 10/26/07
35	Execution Edit and Review	3 days	Mon 10/29/07	Wed 10/31/07
36	**Controlling**	**2 days**	**Thu 11/1/07**	**Fri 11/2/07**
37	Status Report	2 days	Thu 11/1/07	Fri 11/2/07
38	**Closing**	**22 days?**	**Mon 11/5/07**	**Tue 12/4/07**
39	Prepare Final Project Report	14 days	Mon 11/5/07	Thu 11/22/07
40	Prepare Final Presentation	7 days	Fri 11/23/07	Mon 12/3/07
41	Lessons Learned	1 day?	Tue 12/4/07	Tue 12/4/07
42	Submit	0 days	Tue 12/4/07	Tue 12/4/07

APPENDIX C: NETWORK DIAGRAM

NETWORK DIAGRAM, PHASE I



NETWORK DIAGRAM, PHASE II



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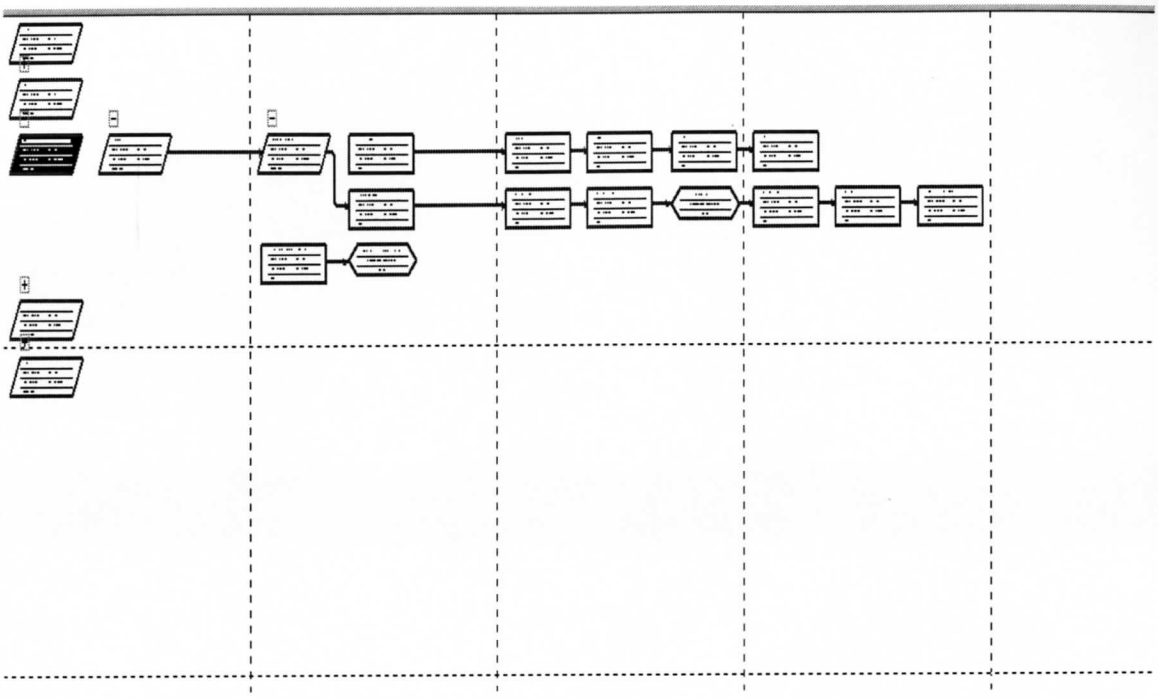
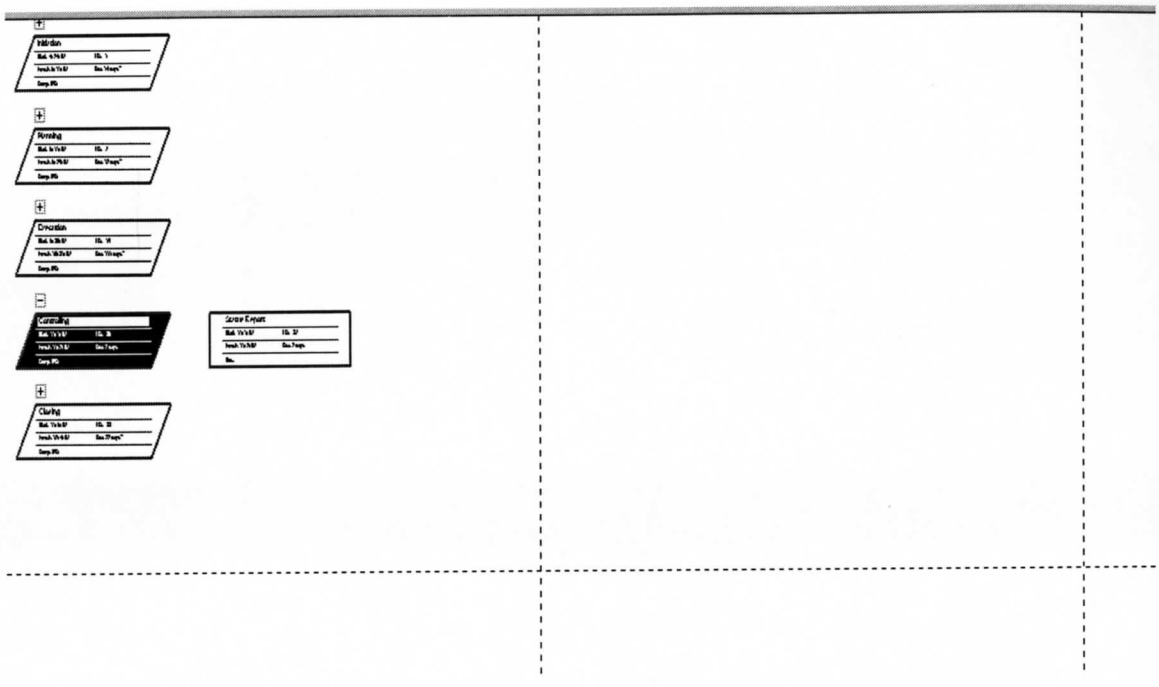
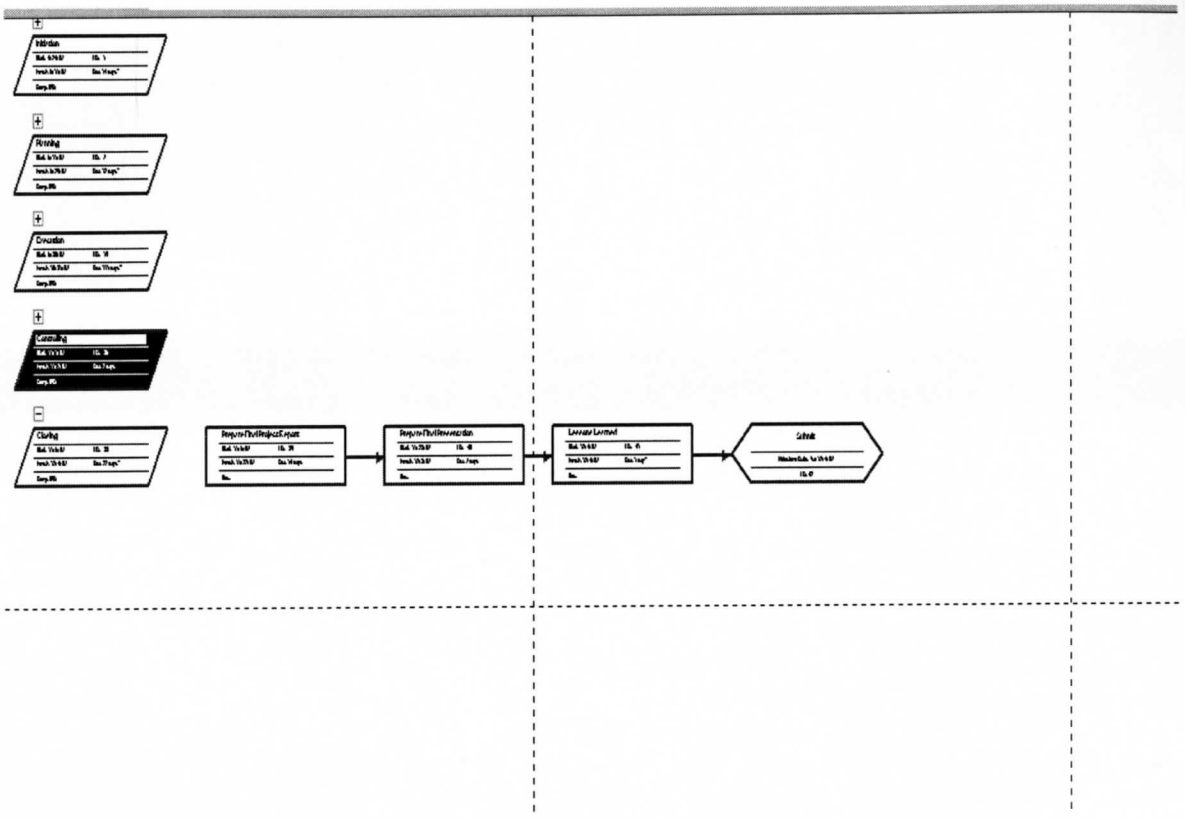


NETWORK DIAGRAM, PHASE IV



NETWORK DIAGRAM, PHASE V



APPENDIX D: INTERVIEW

Interview Questions

Overview

This application is designed to be tailored to meet many of the current requirements of the Women's Center's scheduling process. Through this interview and additional elicitation questionnaires/interviews, I hope to gain a much better understanding of what you (as members of the scheduling committee) feel would better suit your needs.

It is my intent to create an initial stand alone scheduling application that will meet many of the Women's Center's requirements without actually using any confidential information or compromising anyone's personnel or employment information. Once the stand alone application is produced, then discussions can be introduced with McKennan hospital to see if this is something they would like to implement.

This questionnaire/interview contains 5 parts. The first part simply discusses the user's profile. The second part involves becoming familiar with the background of the current situation. The third part delves into the problems with the current system and what the scheduling committee would like to see in the new application. The fourth part has to deal with more of the user environment. And finally the recap section is meant to restate the main talking points discussed in the previous sections and to add any additional information that may be pertinent.

Q/A?

User Profile	
Questions	Answers
1. Name?	Nurse 1, Nurse 2, Nurse 3, Nurse 4
2. Title?	Resource Nurse, Resource Nurse, Resource Nurse, Flight Nurse
3. What are your key responsibilities?	Day to day staff nursing, management, staff/Flight nurse, scheduling committee
4. For Whom? / Who do you answer to?	Management
5. How is success measured?	Verbal or written mentorship program, by patient satisfaction and the health of the mother and child, making sure the schedule is accurate and completed in a timely manner
6. What problems interfere with your success?	Not enough nursing staff, when staff sign up for shifts they don't look at what the numbers are and as a result there will be too many personnel on one day and not enough on other shifts
7. What, if any, trends make your job	Easier – when the staff works as a

easier or more difficult?	team, having more than one person help with the schedule. Harder – trends where there are not enough nurses on a shift
Background <u>Questions</u> 1. To your knowledge, has the administration at McKennan hospital made an effort to fulfill the Women's Center's current scheduling concerns? (For example, have they purchased commercial software items?) 2. If commercial item were purchased, why were they not able to satisfy your requirements? (Functionality, cost, etc…?)	<u>Answers</u> No ??? Yes, Active Staffer, (COTS) they tried it but it did not provide the functionality necessary for the department, no-one uses it 3+ years ago, online, enter schedule from home, all requests went to one person. Overwhelming. It did account for seniority. Could never get it to work out. Currently does not work within Sioux Falls.
The Problem <u>Questions</u> 1. Can you describe the scheduling practice under which you currently operate?	<u>Answers</u> Excel spreadsheet that totals hours and days, we put the schedule out with the weekends/requests marked and the staff have 2-3 weeks to fill in there choice of

	shifts to work,
2. How long have you been operating with this system	4-15 years
3. What are the problems with the current system?	Current spreadsheet is left at the nurse's station for 2-3 weeks. The schedule is then manually checked for enough nurses, vacation time, time off etc... Lots of manipulation, even by personnel not on the scheduling committee.
4. What else?	People don't look at other's schedules before putting their own down. A lot of redundancy.
5. For each problem ask: a. Why does the problem exist?	Everything is penciled in, nurses don't look at other's schedules to reduce redundancy
b. How do you solve it now?	Complain to scheduling committee
c. How would you like to solve it?	Create a program that locks people out of others schedules, account for seniority, make it accessible from home, account for existing practices
6. What is your current editing process like?	Currently we edit the schedule by taking it down after 3 weeks, people have to sign up and then enter all of the staff manually, after entering them manually we look at the

	requirements make by management
7. How long does it take to develop the schedule for the next scheduling period?	It is difficult to say, but initially it takes a couple hours to just put in all of the requests and holiday switches if any, and then once it is taken down to do the final tallies, it takes at least 2 hours filling in everyone's choice and then another 2-3 hours of finalizing it.
The User Environment	
<u>Questions</u>	<u>Answers</u>
1. Who will the users be?	About 90 personnel
2. What is their educational background?	BS's
3. What is their computer background?	Limited to extensive
4. What platforms are currently in use?	Windows based
5. What is the department's plan for this application in regards to future use?	We plan on using it as long as it meets the needs of the department.
6. What are your expectations for this application?	Easy to use, tally each shift, each nurse can log in, edit their schedule and log out, keep editing to a minimum, only let management edit schedule, account for nights, weekends, holidays, seniority

7. What is the department's plan for this application in regards to future use?	We would like to use it for the next several years
8. What are your expectations for training time?	Training time for this application should be kept to a minimum. 2-4 hours
9. How do you feel you will benefit from this new application?	Ease the process and less work after hours on trying to get the schedule done. Get the schedule back sooner.

APPENDIX E: REQUIREMENTS

Requirements

1. The scheduling system must allow nurses to create work schedules
    1.1. The nurse must be able to log in
        1.1.1. The nurse must have a valid user name
            1.1.1.1. The user name must be unique
            1.1.1.2. The user name must contain only letters
            1.1.1.3. The user name must not be in use by another nurse
        1.1.2. The nurse must have a valid password
            1.1.2.1. The password must be unique
            1.1.2.2. The password must be at least 7 characters long
            1.1.2.3. The password must contain at least 1 non-alphanumeric character
            1.1.2.4. The password must be changed once every 6 months
            1.1.2.5. The password must be different than previous passwords
        1.1.3. The nurse must have a valid security question
            1.1.3.1. The security question must be in the form of a question
            1.1.3.2. The security question must contain only letters and numbers
        1.1.4. The nurse must have a valid security answer
            1.1.4.1. The security answer must be at least 3 characters long
            1.1.4.2. The security answer must be in the same language as the question
    1.2. The nurse must register
        1.2.1. The nurse must create a user name
            1.2.1.1. The user name must be unique
            1.2.1.2. The user name must not be used by another nurse
            1.2.1.3. The user name must be filled in on the register page
        1.2.2. The nurse must create a password
            1.2.2.1. The password must be at least 7 characters long
            1.2.2.2. The password must contain at least 1 non-alphanumeric character
            1.2.2.3. The password must be changed once every 6 months
            1.2.2.4. The password must be different than previous passwords
            1.2.2.5. The password must be filled in on the register page
        1.2.3. The nurse must verify their password
            1.2.3.1. The password must match the initial password verbatim
            1.2.3.2. The password must be entered on the register page
        1.2.4. The nurse must create a security question
            1.2.4.1. The security question must be filled in on the register page
            1.2.4.2. The security question must be in the form of a question
            1.2.4.3. The security question must contain only letters and numbers
        1.2.5. The nurse must provide an answer to the security question
            1.2.5.1. The answer to the security question must be filled in on the register page
            1.2.5.2. The answer to the security question must be in the same language

1.3. The nurse must be in good standing with the hospital
  1.3.1. The hospital must be recognized by the state of South Dakota
  1.3.2. The nurse must have a valid degree in nursing
    1.3.2.1. The degree must be from an accredited school
1.4. The nurse must be able to only work a maximum of 12 hours in 1 day
  1.4.1. The hours worked must be affiliated with the same hospital
1.5. The nurse must be familiar with a computer
  1.5.1. The computer must have a mouse
  1.5.2. The computer must have a keyboard
  1.5.3. The computer must implement a windows based OS
    1.5.3.1. The OS must contain Windows XP
  1.5.4. The computer must contain a user friendly interface
  1.5.5. The computer must contain a web browser
    1.5.5.1. The web browser must contain Internet Explorer
1.6. The nurse must be familiar with a windows based operating system
  1.6.1. The operating system must contain Microsoft Excel
    1.6.1.1. Microsoft Excel must be 2003 or newer
  1.6.2. The operating system must contain Microsoft Word
    1.6.2.1. Microsoft Word must be 2003 or newer
1.7. The nurse must be a registered nurse with the state of South Dakota
  1.7.1. The state of South Dakota must have the nurses license
    1.7.1.1. The license must be up to date
1.8. The nurse must be familiar with Microsoft Word
  1.8.1. Microsoft Word must be the 2003 version or newer
1.9. The nurse must be familiar with Microsoft Excel
  1.9.1. Microsoft Excel must be the 2003 version or newer

2. The scheduling system must allow the managers to review the proposed schedules
  2.1. The managers must be on the scheduling committee
    2.1.1. The scheduling committee must contain up to 5 members
      2.1.1.1. All members must be in good standing with the hospital
      2.1.1.2. All members must have been appointed to the position
  2.2. The managers must have the correct permissions to review the proposed schedule
    2.2.1. The managers must have read/write permissions to review the proposed schedule
  2.3. The managers must be familiar with the Windows OS
  2.4. The proposed schedules must contain 9 night shifts within the 6 week period
    2.4.1. The night shifts must be scheduled 3 night shifts in a 2 week period
  2.5. The proposed schedules must be submitted 2 weeks prior to the end of the scheduling period

3. The scheduling system must allow the managers to edit the proposed schedules
  3.1. The managers must have access writes to all submitted schedules
    3.1.1. The managers must have read/write access privileges
      3.1.1.1. Universal privileges must extend only to the scheduling committee
    3.1.2. The managers must have enough time to edit all schedules

3.1.2.1. The editing process must stay under 1 hour

3.2. The managers must have all of the schedules to edit

3.2.1. All of the schedules must be submitted two weeks prior to schedule execution

3.2.2. All of the schedules must be rolled up into a master schedule

3.3. The managers must have access to the master schedule

3.3.1. The master schedule must be compiled 2 weeks prior to the end of the scheduling period

3.3.2. The master schedule must contain a rollup of all of the schedules submitted

3.3.3. The master schedule must be accessible from the web

3.3.4. The master schedule must be in a dataset format

4. The scheduling system must allow the managers to delete the proposed schedules

4.1. The proposed schedules must be submitted 2 weeks prior to the end of the schedule period

4.2. The proposed schedule must have a button to cancel the proposed schedules

4.2.1. The button must be linked to the master schedule

4.3. The proposed schedule must revert to the previous schedule if current schedule is cancelled

5. The scheduling system must allow the managers to save the proposed schedules

5.1. A button must be present to allow the managers to save the proposed schedule

5.2. The managers must have the correct permissions to save the proposed schedule

5.2.1. The permissions must include read/write access

5.3. The proposed schedule must be saved 3 days prior to posting the schedule

6. The scheduling system must allow the nurses to load a previously created schedule

6.1. The nurses must have the proper permissions to load a previous schedule

6.1.1. The permissions must include read/write access

6.2. The previous schedule must be a previously created schedule

6.2.1. The created schedule must be loaded by the nurse that created it

6.3. The previous schedule must be in read/write format

6.3.1. The format must allow the nurse to make changes to the schedule

6.4. The previous schedule must not have been approved

6.4.1. An approved schedule must have only read access

7. The scheduling system must allow the nurses to load a previously approved schedule

7.1. The approved schedule must be in read only format for regular nurses

7.2. A previously approved schedule must be accessible to all nurses

7.3. The previously approved schedule must have read/write permissions for managers

8. The scheduling system must allow the nurses to save the current schedule

8.1. The current schedule must have a button to save the current schedule

8.1.1. The save button must allow the user to point to a location on the hard drive to save the document to

8.2. The current schedule must retain its read/write permissions

9. The scheduling system must allow the nurses to edit their current schedule
   9.1. The current schedule must have a load feature enabled
      9.1.1. The load feature must be part of the schedule page
   9.2. The current schedule must maintain read/write attributes for the author
   9.3. The current schedule must have a save button
      9.3.1. The save button must be part of the schedule page
   9.4. The current schedule must maintain read attributes for all non-authors

10. The scheduling system must allow the nurses to save a revised schedule
   10.1. The revised schedule must maintain read/write permissions
   10.2. The revised schedule must have a save button
   10.3. The revised schedule must be submitted no later than 2 weeks prior to publishing the schedule

11. The scheduling system must roll up all schedules into a master schedule
   11.1. The nurses must submit the current schedule to compile the master schedule
   11.2. The master schedule must incorporate all of the nurses schedules
      11.2.1. The nurses schedules must be compiled and tabulated prior to posting
   11.3. The master schedule must allow the nurses to input their desired schedule according to seniority

12. The Scheduling system must allow the managers to save the proposed schedule
   12.1. Seniority must be based on the number of years the nurse has worked in the department
   12.2. The master schedule must be placed in a dataset
      12.2.1. The dataset must be accessible to all of the nurses in the department
      12.2.2. The dataset must contain read only permissions for nurses
      12.2.3. The dataset must contain read/write permissions for managers
      12.2.4. The dataset must be savable my managers
      12.2.5. The dataset must be able to be deleted my managers
   12.3. The master schedule must have read/write permissions for managers
   12.4. The master schedule must have read only permissions for nurses
   12.5. The master schedule must be able to be saved my managers
   12.6. The master schedule must be able to be rejected my managers

APPENDIX F: USE CASES

Use Case #1

Use Case Name: New User Registration	ID Number: 01
Short Description: New nurses must complete register form and obtain a login ID and password	
Trigger: Nurses must create a schedule **Primary Actor:** Nurse	
Guarantees **Success End Condition:** Login ID and password is issues to the nurse **Failed End Condition:** No Failure	**Stakeholders:** Nurse **Preconditions:** Nurse should have proper address
Success Scenario 1. Nurse enters login page URL into computer 2. Computer displays login form 3.a. Nurse enters login ID and password 4. Computer verifies user ID and password 5. Nurse is directed to main schedule page	**Extensions** *a. Nurse's login ID and password are not in database *a.1. Nurse may change their mind at any time and exit [Fail] 3.b. Nurse is redirected to the registration page 3.b.1. Nurse completes the registration form 3.b.2. Nurse is redirected back to the login page [repeat step 2]

Use Case #2

Use Case Name: Creating a schedule	ID Number: 02
Short Description: Nurses select a series of days, hours, and shift they would like to work for a 6 week period	
Trigger: Nurses are nearing the end of the current schedule **Primary Actor:** Nurse	
Guarantees **Success End Condition:** Nurse is able to complete all/part of their schedule for the next scheduling period **Failed End Condition:** Nurse is unable to log on	**Stakeholders:** Nurse **Preconditions:** Nurses are validated through the login page
Success Scenario 1. Nurse selects a day from the calendar 2. Nurse then selects either a 12 hour shift or an 8 hour shift 3. Nurse then selects a Day, Evening, or Night shift 4. Nurse then submits selected data 5. List box displays the selected data at the bottom of the screen 6. Nurse repeats steps 1-4 for a 6 week period	**Extensions** *a. System may fail or staff member may decide to quit at any time

Use Case #3

<table>
<tr><td colspan="2">Use Case Name: Users save the proposed schedule</td><td>ID Number: 03</td></tr>
<tr><td colspan="3">Short Description: The nurses have created all or part of a schedule and need to save it</td></tr>
<tr><td colspan="3">Trigger: All or part of a schedule has been created and not yet approved
Primary Actor: Nurse</td></tr>
<tr><td colspan="2">Guarantees
Success End Condition: Nurse is able to save the proposed schedule
Failed End Condition: System will not save data</td><td>Stakeholders: Nurse

Preconditions: Nurse is able to complete some/all of the schedule</td></tr>
<tr><td colspan="2">Success Scenario
1. Nurse inputs data into a schedule
2. Nurse elects to save data onto hard drive
3.a. System saves information onto hard drive
4. System displays a confirmation</td><td>Extensions

*a. System may display an error
a.1. System closes down [Fail]
a.2. System directs the user back to the schedule page
a.3. User must start over at step 1

* The nurse can elect to cancel or exit at any time throughout this process</td></tr>
<tr><td colspan="2"></td><td></td></tr>
</table>

Use Case #4

Use Case Name: Users edit the proposed schedule	ID Number: 04
Short Description: The nurse loads a previously saved schedule so they can edit it	
Trigger: The nurse needs to review/ edit the schedule **Primary Actor:** Nurse	
Guarantees **Success End Condition:** Nurse is able to edit the proposed schedule **Failed End Condition:** System will not load data so it can be edited	**Stakeholders:** Nurse **Preconditions:** Nurse has all/part of the schedule already created and saved
Success Scenario 1. The nurse loads a previously created schedule 2. The system displays the schedule 3. The nurse makes changes to the schedule 4. The nurse elects to re-save the schedule 5. The system displays a confirmation message	**Extensions** * The nurse can elect to cancel or exit at any time throughout this process

Use Case #5

Use Case Name: User saves the revised schedule	ID Number: 05
Short Description: Once the schedule has been edited, it needs to be re-saved	
Trigger: The nurse has already loaded and edited the proposed schedule **Primary Actor:** Nurse	
Guarantees **Success End Condition:** Nurse is able to save the revised schedule **Failed End Condition:** System will not allow the data to be saved	**Stakeholders:** Nurse **Preconditions:** Nurse has changed some/all of the data
Success Scenario 1. The nurse edits the proposed schedule 2. The nurse elects to save the revised schedule 3. The system displays a confirmation message	**Extensions** * The nurse can elect to cancel or exit at any time throughout this process

Use Case #6

Use Case Name: User loads a previously created schedule	ID Number: 06
Short Description: A saved schedule is loaded into the systems so the user can edit it	
Trigger: The nurse needs to review/ edit the schedule **Primary Actor:** Nurse	
Guarantees **Success End Condition:** Nurse is able to load a previous schedule **Failed End Condition:** System will not load an existing schedule	**Stakeholders:** Nurse **Preconditions:** Nurse has already created a schedule
Success Scenario 1. A nurse logs on to a computer 2.a. A nurse loads a previously created schedule 3. The system displays a load dialog box 4. The user selects the schedule to load 5. The system loads the schedule	**Extensions** *a. The system does not load the schedule a.1. The system directs the user back to the schedule page * The nurse can elect to cancel or exit at any time throughout this process

Use Case #7

Use Case Name: User loads a previously approved schedule	ID Number: 07
Short Description: An approved schedule is loaded for review	
Trigger: A nurse needs to reference an existing schedule **Primary Actor:** Nurse	
Guarantees **Success End Condition:** Nurse is able to load a previously approved schedule **Failed End Condition:** System will not load an approved schedule	**Stakeholders:** Nurse **Preconditions:** Nurses have all submitted their proposed schedule
Success Scenario 1. A nurse logs on to a computer 2.a. A nurse loads a previously approved schedule 3. The system displays a load dialog window 4. The nurse selects the schedule to display 5. The system displays the approved schedule	**Extensions** *a. The system does not load the requested schedule a.1. The nurse is directed back to the schedule page * The nurse can elect to cancel or exit at any time throughout this process

Use Case #8

Use Case Name: Management reviews/edits proposed schedule	ID Number: 08
Short Description: Managers are able to review /edit the schedule once all nurses have submitted theirs	
Trigger: Mangers need to review and edit the schedule before publication **Primary Actor:** Nurse/managers	
Guarantees **Success End Condition:** Manager is able to review/edit the proposed schedule **Failed End Condition:** System will not compile proposed schedule	**Stakeholders:** Nurse/managers **Preconditions:** Managers have access rights to review/edit the schedule
Success Scenario 1. A manager logs on to the system 2. The manager loads the schedule 3. The manager makes changes to the schedule as necessary 4. The manager elects to save the schedule 5. The system saves the changes to the database	**Extensions** * The manager can elect to cancel or exit at any time throughout this process

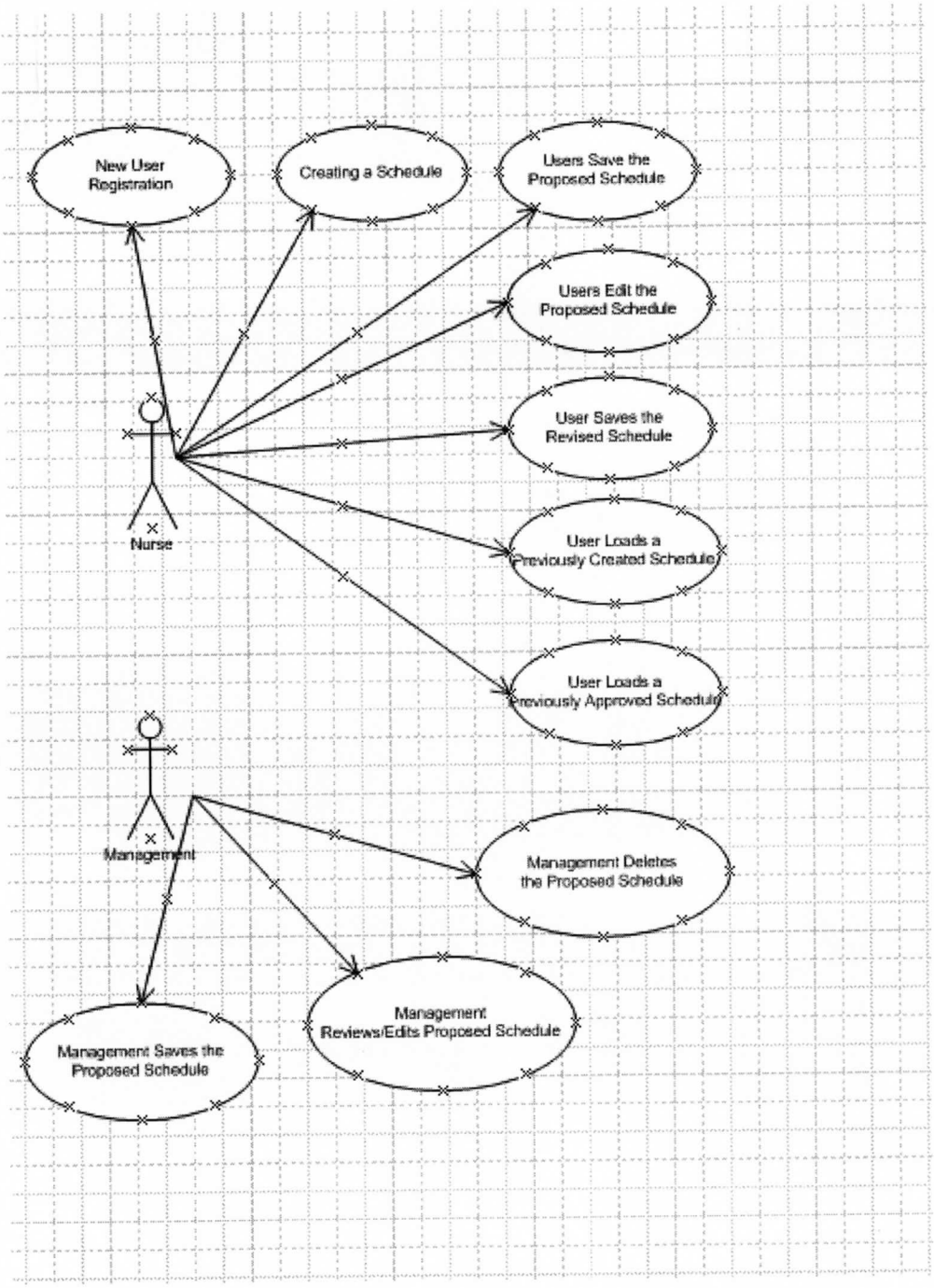
Use Case #9

Use Case Name: Management deletes the proposed schedule	ID Number: 09
Short Description: Managers are able to delete the proposed schedule	
Trigger: Managers are not comfortable with or do not have the correct schedules **Primary Actor:** Nurse/managers	
Guarantees **Success End Condition:** Manager is able to delete the proposed schedule **Failed End Condition:** System will not delete the proposed schedule	**Stakeholders:** Nurse/managers **Preconditions:** Managers have access rights to delete the schedule
Success Scenario 1. A manager loads the proposed schedule 2.a. The manager deletes the proposed schedule 3. The system prompts the manager for confirmation 4. The manager selects yes from the options and the schedule is deleted	**Extensions** *a. The system displays an error and will not delete schedule a.1. The manager is directed back to the schedule page a.2. The manager does not have the correct permissions to delete a.2.a. The system displays the lack of permissions a.2.b. The system closes down * The manager can elect to cancel or exit at any time throughout this process

Use Case #10

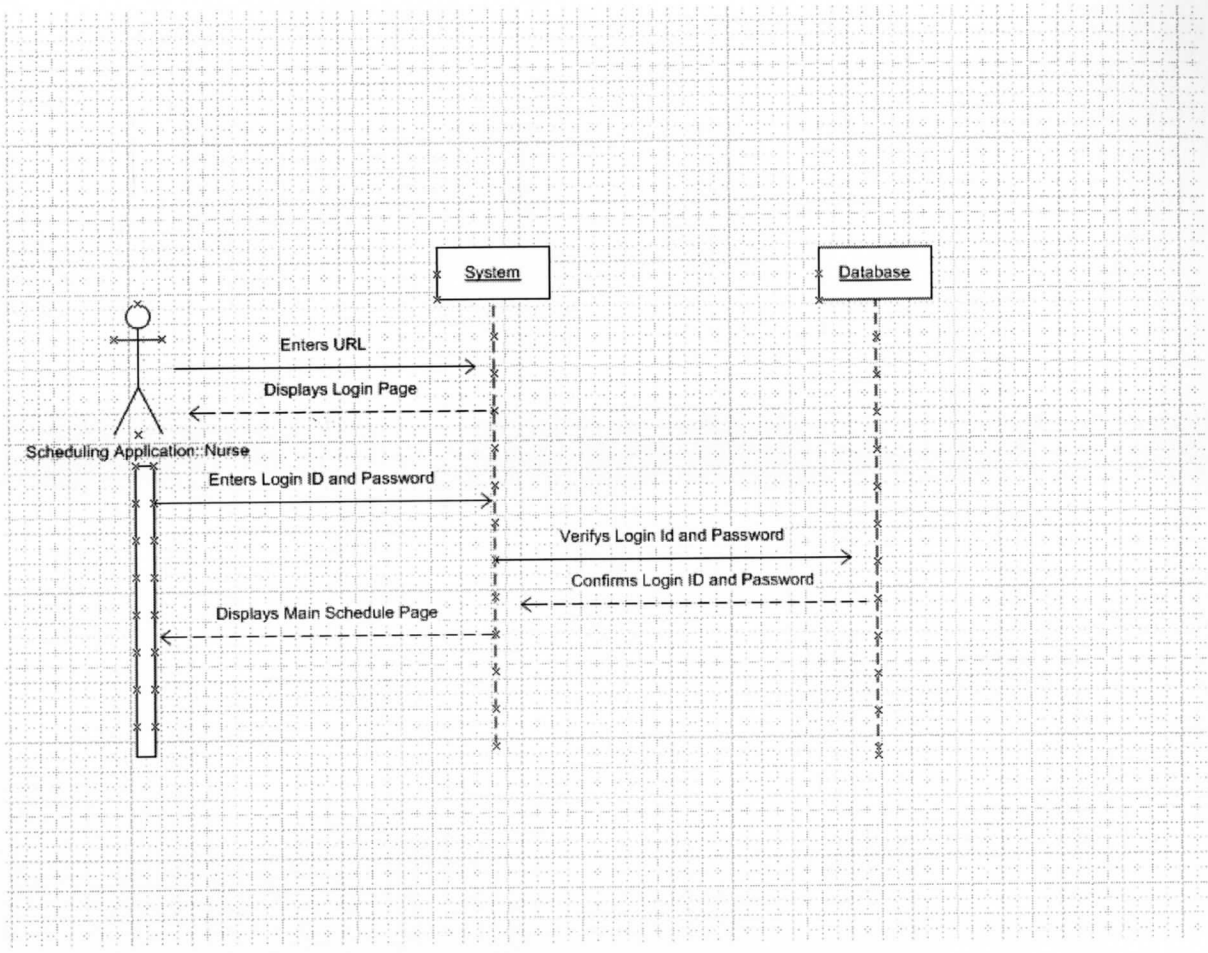
Use Case Name: Management saves the proposed schedule	ID Number: 10
Short Description: Managers are able to save the proposed schedule	
Trigger: The schedules have been reviewed **Primary Actor:** Nurse/managers	
Guarantees **Success End Condition:** Manager is able to save the proposed schedule **Failed End Condition:** System will not save the proposed schedule	**Stakeholders:** Nurse/managers **Preconditions:** Managers have access rights to save the schedule
Success Scenario 1. A manager loads the proposed schedule 2. The manager saves the proposed schedule 3. The system displays the confirmation	**Extensions** * The manager can elect to cancel or exit at any time throughout this process

APPENDIX G: USE CASE DIAGRAM

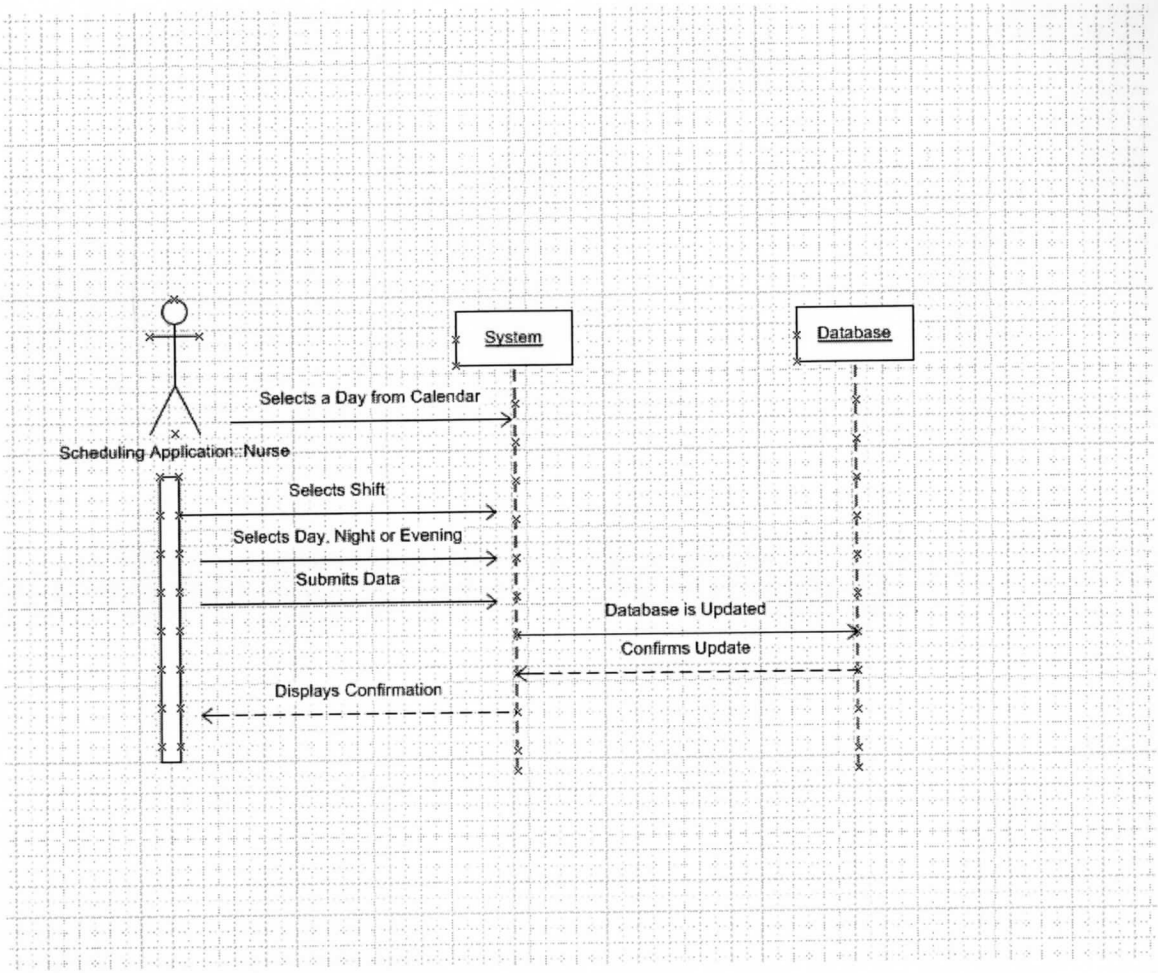


APPENDIX H: SEQUENCE DIAGRAMS

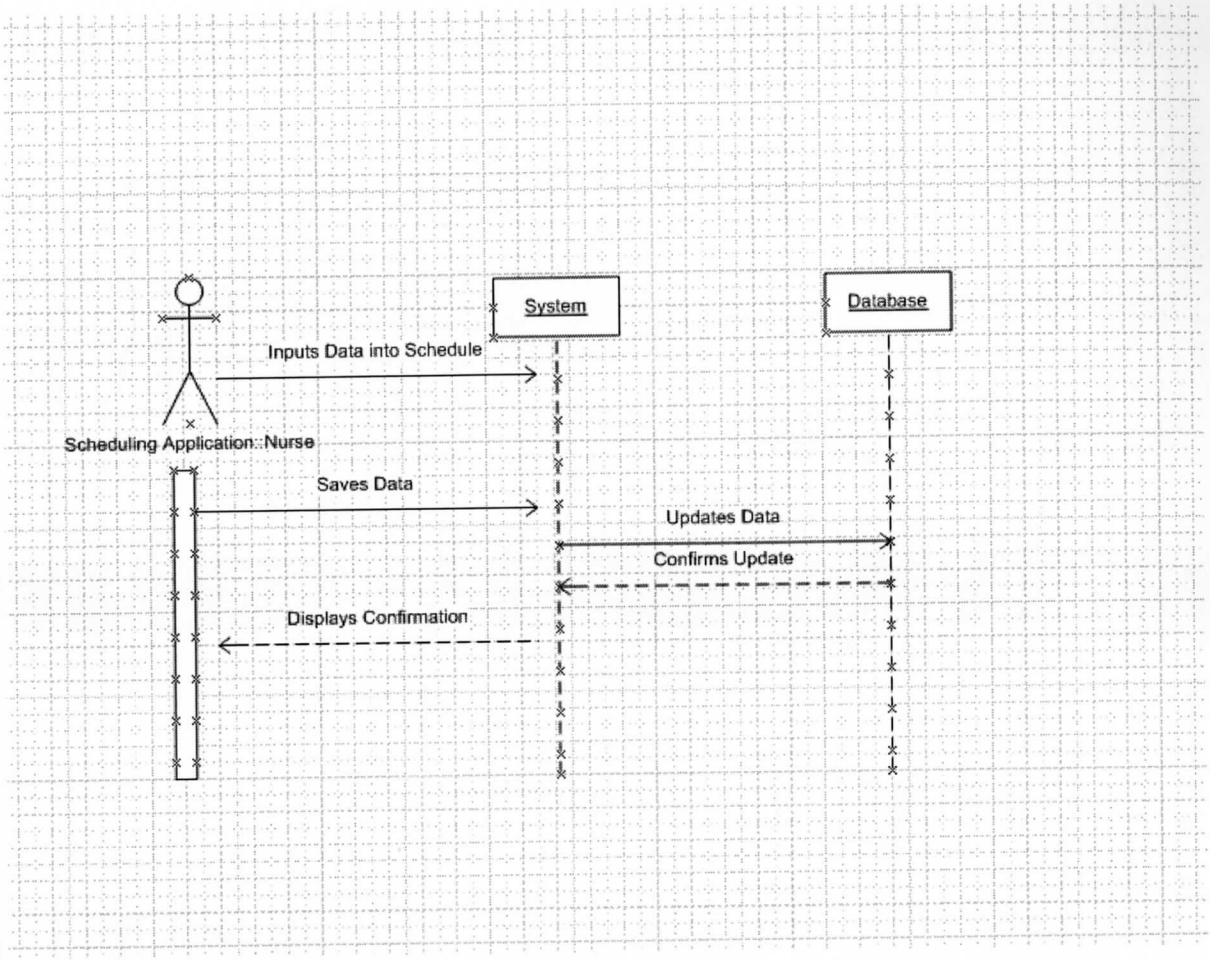
New User Registration



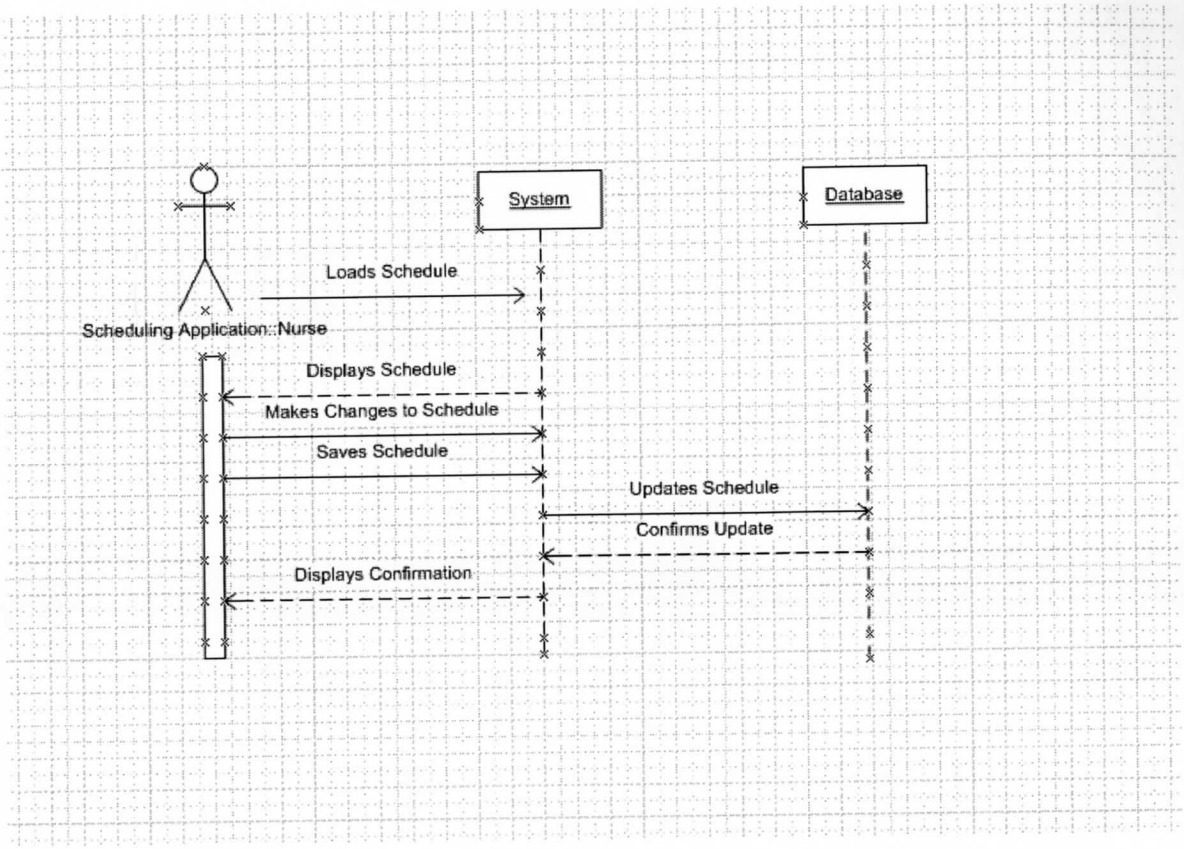
Creating a Schedule



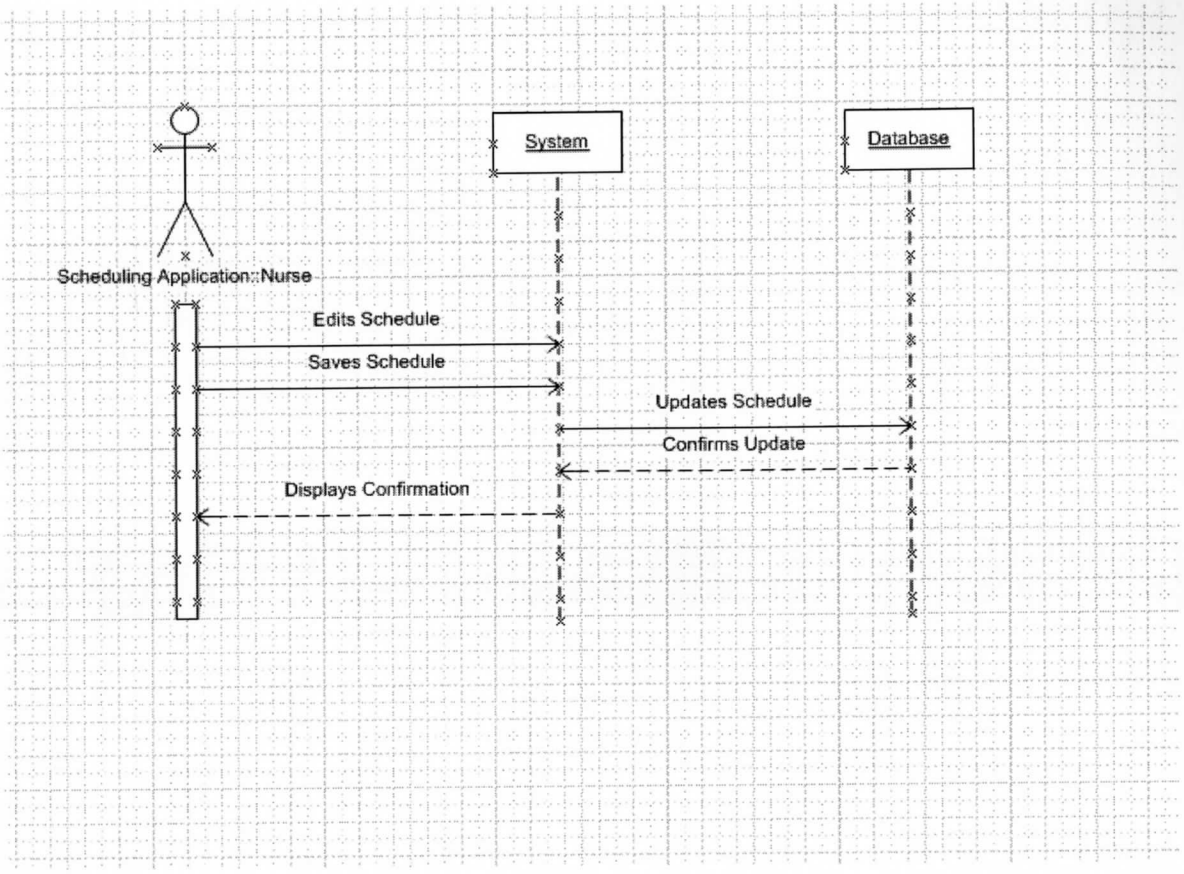
Users Save the Proposed Schedule



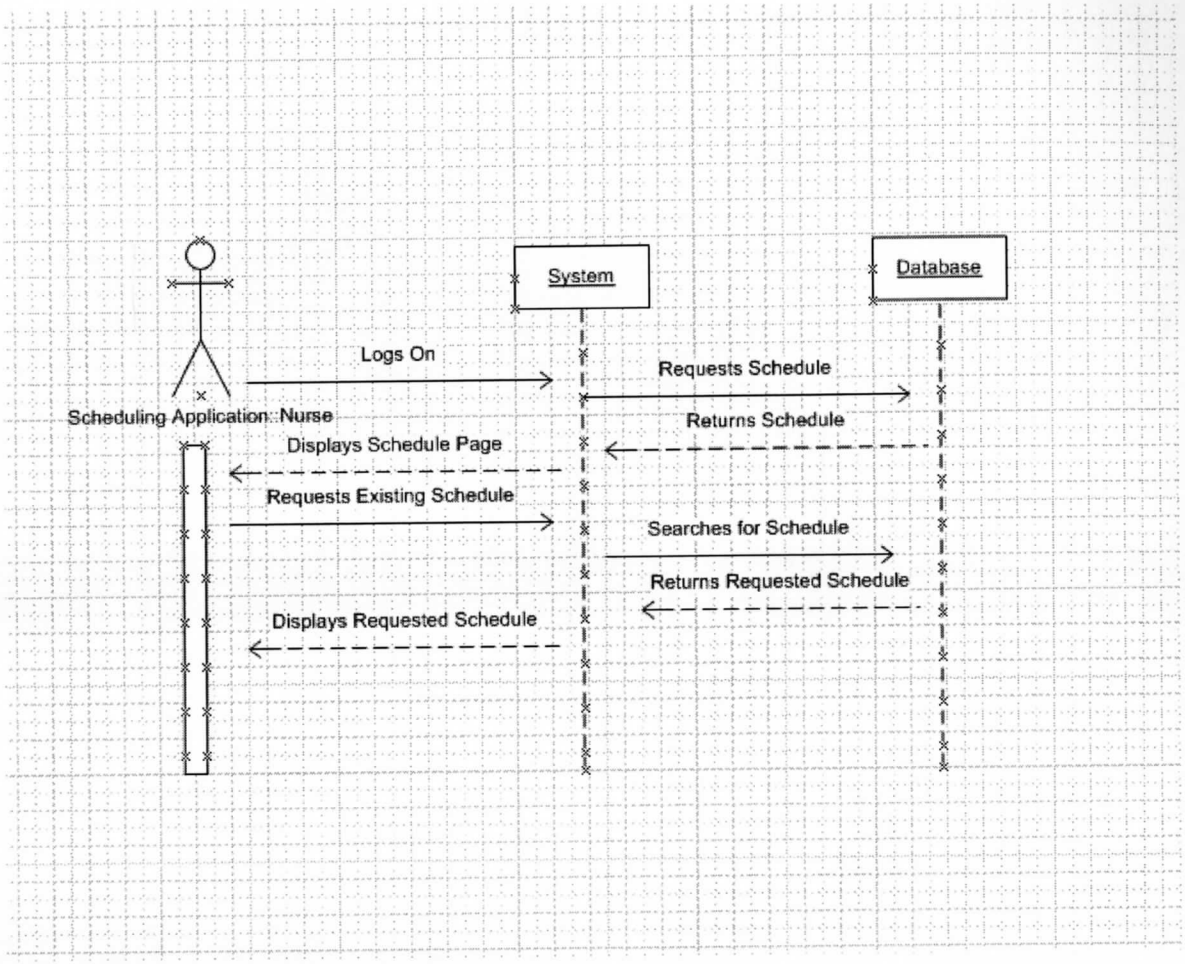
Users Edit the Proposed Schedule



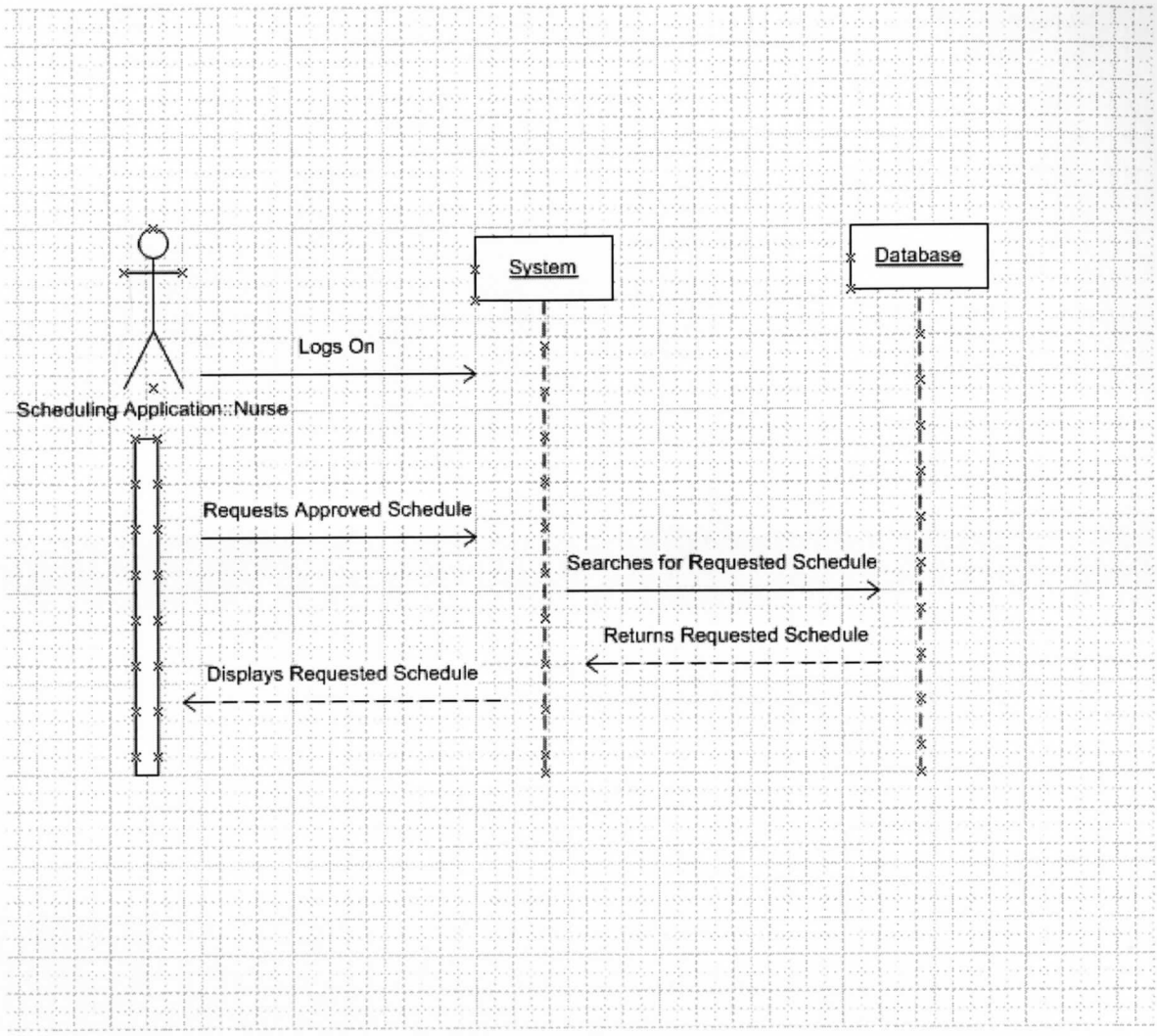
User Saves the Revised Schedule



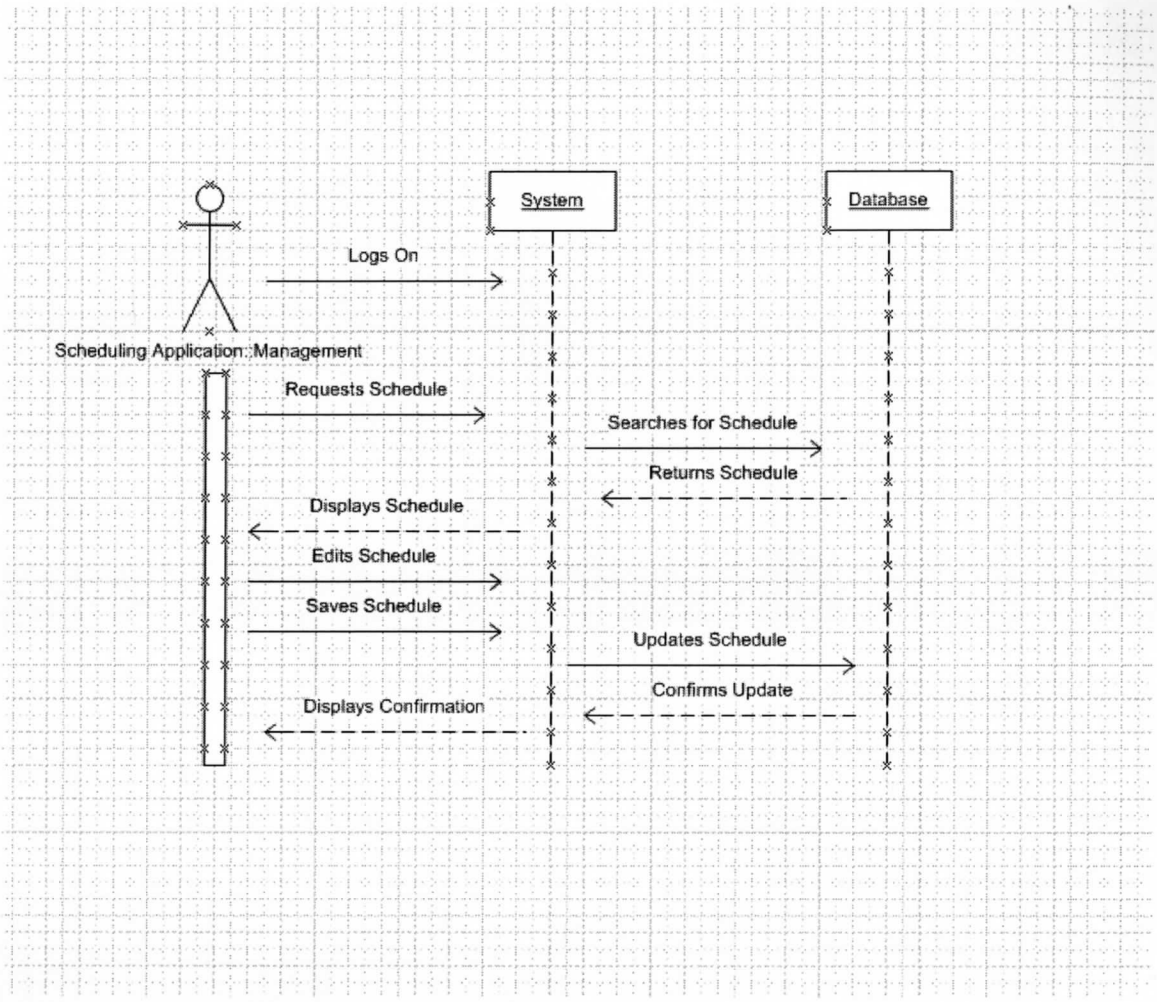
User Loads a Previously Created Schedule



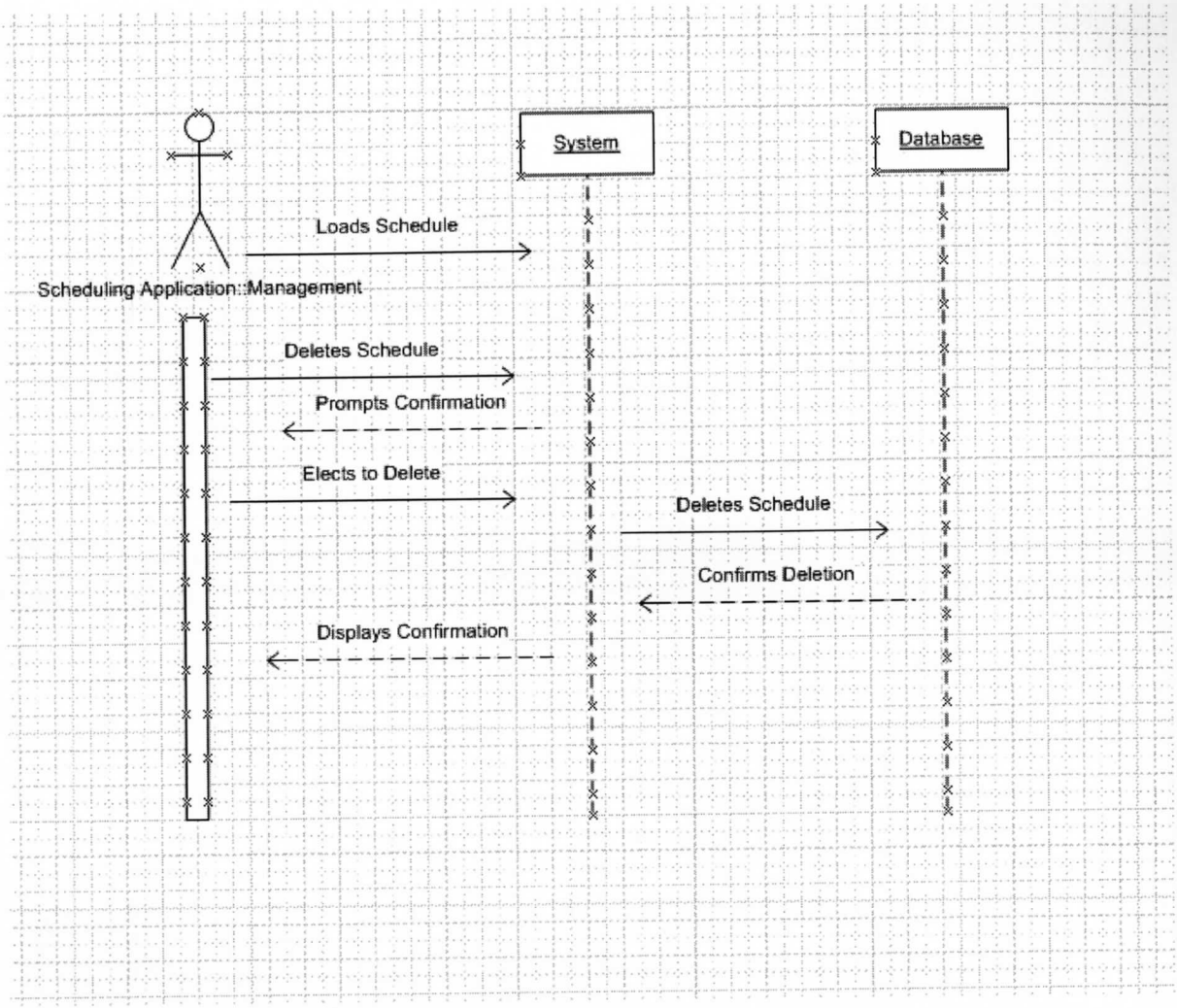
User Loads a Previously Approved Schedule



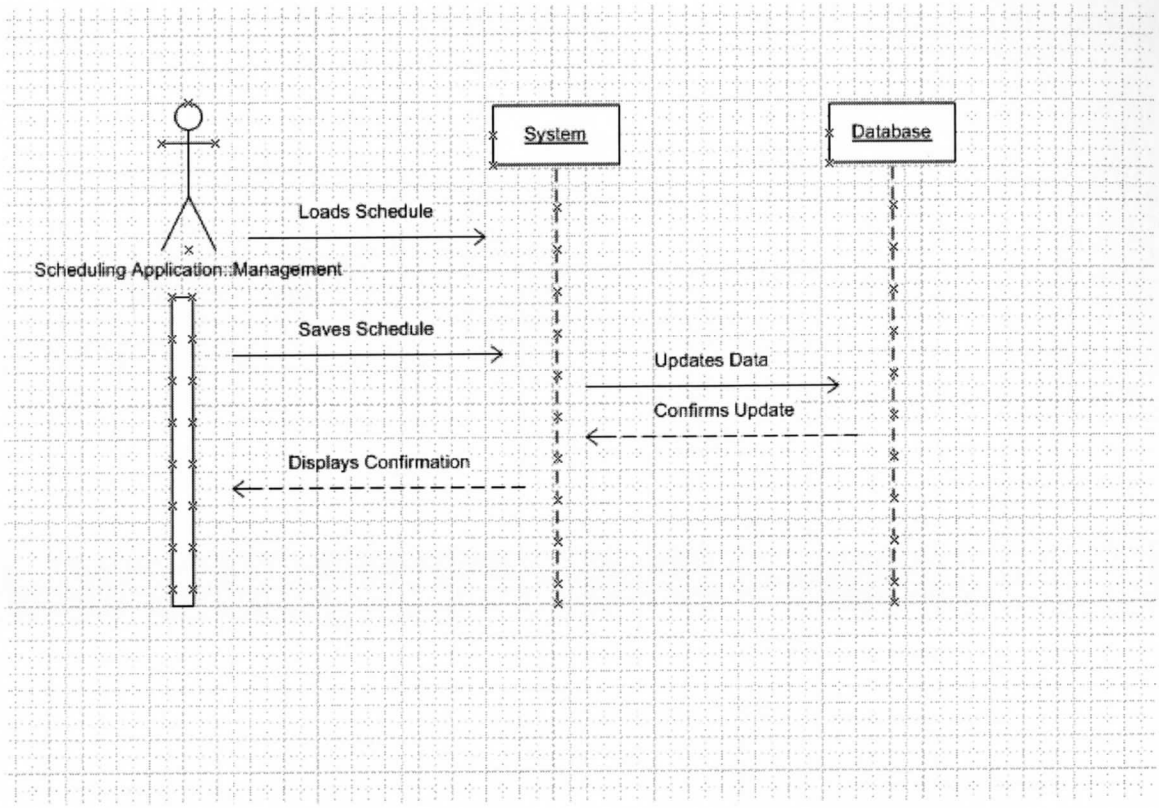
Management Reviews/Edits Proposed Schedule



Management Deletes Proposed Schedule



Management Saves the Proposed Schedule



APPENDIX I: CODE

Login Page Code:

```
<%@ Page Language="C#" %>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">

<script runat="server">


</script>

<html xmlns="http://www.w3.org/1999/xhtml" >
<head id="Head1" runat="server">
    <title>Schedule Login</title>
</head>
<body style="background-color:#d8e4e8">
    <form id="form1" runat="server">
    <div>
    <br />
    <br />
    <table width="100%" style="background-color:#d8e4e8">
    <tr>
    <td align="Center">
    <table border="5">
    <tr>
    <td>


    <asp:Login
        id="Login1"
        CreateUserText="Register"
        CreateUserUrl="~/Register.aspx"
        Runat="server"  />
    </td></tr></table></td></tr></table>
    </div>
    </form>
</body>
</html>
```

Register Page Code:

```
<%@ Page Language="C#" %>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" >
<head id="Head1" runat="server">
    <title>Register</title>
</head>
<body>
    <form id="form1" runat="server">
    <div>
    <table border="10"><tr><td>
    <asp:CreateUserWizard
        id="CreateUserWizard1"
        ContinueDestinationPageUrl="~/Schedule.aspx"
        RequireEmail="False"
        Runat="server" />
    </td></tr></table>
    </div>
    </form>
</body>
      </html>
```

Schedule Page Code (ASP.NET and HTML):

```
<%@ Page Language="C#" Theme="StyleTheme" AutoEventWireup="true"
CodeFile="Schedule.aspx.cs" Inherits="Default2" %>

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">

<html xmlns="http://www.w3.org/1999/xhtml" >
<head id="Head1" runat="server">

    <title>Schedule</title>
</head>
<body>
    <form id="form1" runat="server">
    <div>
    <table class="table1" >
    <tr>
    <td>
    <table class="tablecalendar" >
    <tr>
    <td>
        <asp:Calendar ID="Calendar1" cssclass="calendar1"
            BorderWidth="1px"
            ForeColor="Black"
            SelectionMode="Day"
            NextPrevFormat="FullMonth"
            Runat="Server"
            DayHeaderStyle-Font-Underline="true">
        <SelectedDayStyle
            cssclass="selecteddaystyle"
            ForeColor="White" />
        <OtherMonthDayStyle
            ForeColor="#999999" />
        <TodayDayStyle
            cssclass="todaydaystyle" />
        <NextPrevStyle
            cssclass="nextprevstyle"
            ForeColor="#333333"
            VerticalAlign="Bottom" />
        <DayHeaderStyle
            cssclass="dayheaderstyle" />
        <TitleStyle
            cssclass="titlestyle"
            ForeColor="#333399" />
    </asp:Calendar>  </td></tr></table>  </td></tr></table>
    <br />

        <table class="tablehours" >
        <tr><td class="tabledatahours"><h3>
        <asp:Label
        CssClass="labelhours"
        ID="lblHours"
```

```
Text="Hours per Shift"
runat="Server">
</asp:Label><br /></h3>

<asp:RadioButton
ID="rdl12hour"
Text="12 Hour Shift"
GroupName="hours"
runat="Server" />  

<asp:RadioButton
ID="rdl8hour"
Text="8 Hour Shift"
GroupName="hours"
runat="Server" /> <br /><br />
</td>

<td class="tabledatashift"><h3>

<asp:Label
CssClass="labelshift"
ID="lblShift"
Text="Type of Shift"
runat="Server" ></asp:Label><br /></h3>

<asp:RadioButton
ID="rdlday"
Text="Day Shift"
GroupName="Shift"
runat="server" />  

<asp:RadioButton
ID="rdlevening"
Text="Evening Shift"
GroupName="Shift"
Runat="server" />  

<asp:RadioButton
ID="rdlnight"
Text="Night Shift"
GroupName="Shift"
runat="server" /><br /><br />

</td></tr></table>

<br />
<hr />
<br />

<asp:Button
CssClass="buttonsubmit"
ID="btnSubmit"
runat="server"
OnClick="btnSubmit_Click"
Text="Submit" />

<asp:Button
```

```
        id="btnSaveListbox"
        onclick="btnSaveListbox_Click"
        runat="server" />


      <br />
        <p>You have chosen the following dates for your schedule:</p>


        <asp:ListBox
        ID="ListBox1"
        runat="Server" Rows="7"
        AppendDataBoundItems="true">
        </asp:ListBox>

        <br />
        <br />

        <asp:Label
        ID="lblsavetext"
        runat="server" ></asp:Label>

       </div>
    </form>
</body>
</html>
```

Schedule Code Behind Page (C#):

```
using System;
using System.Data;
using System.Drawing;
using System.Configuration;
using System.Collections;
using System.Collections.Generic;
using System.ComponentModel;
using System.IO;
using System.Text;
using System.Web;
using System.Web.Security;
using System.Web.UI;
using System.Web.UI.WebControls;
using System.Web.UI.WebControls.WebParts;
using System.Web.UI.HtmlControls;


public partial class Default2 : System.Web.UI.Page
{

    string dayNight = String.Empty;
    string shiftLength = String.Empty;
    string shiftDate = String.Empty;
    string shiftInfo = String.Empty;

    //btnSubmit combines the date selected with the 2 radiobutton choices,
hours and shift.


    protected void btnSubmit_Click(object sender, EventArgs e)
    {
        // verifies checked events

        if (rdl12hour.Checked)
            shiftLength = "12";

        if (rdl8hour.Checked)
            shiftLength = "8";

        if (rdlday.Checked)
            dayNight = "Day";

        if (rdlevening.Checked)
            dayNight = "Evening";

        if (rdlnight.Checked)
            dayNight = "Night";
```

```
        shiftInfo = Calendar1.SelectedDate.ToString("* MMM dd, yyyy") + " "
+ shiftLength + " hour " + dayNight + " shift";
        ListBox1.Items.Add(shiftInfo);


    }

}
```